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Assessment of Divisions 4VWX and Subarea 5 Pollock (*Pollachius virens*)

by

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ABSTRACT

The fishery, its regulations and industry related changes are described from 1960-1986. The catch in 1985 of 62,758 t exceeded the previous historical maximum, with the largest increase coming from the USA fishery. Several strong and average year-classes exist in the population and are currently being exploited; however, the catch rates for many gears in 1985 fell to almost 50% of those recorded for 1984. The analysis presented is thus consistent with a decrease in catch rate, but increased catch, reflected in a substantially higher terminal fishing mortality of F_t.55 compared to F_t.35 in 1984. Aspects of note are the provision of a revised catch at age matrix, variance estimates for the catch at age, a stock status matrix, and a new analysis of recruitment.

RESUME

On décrit des changements ayant touché la pêcherie, la réglementation et l'industrie de la pêche de 1960 à 1986. Les prises de 1985, qui s'élevaient à 62 758 t, constituaient un nouveau sommet historique, L'augmentation la plus importante ayant été enregistrée dans la pêcherie des Etats-Unis. On constate qu'il y a dans la population quelques classes d'âges fortes et moyennes et que ces classes sont actuellement exploitées; cependant, le taux de prise pour de nombreaux engins de pêche a chuté de près de 50% en 1985 par rapport à 1984. L'analyse présentée concorde donc avec une diminution du taux de prise, mais avec un accroissement des prises, situation que reflète une mortalité par pêche de dernière année substantiellement plus élevée en 1985: F_t=0,55 comparativement à F_t=0,35 en 1984. Parmi les caractéristiques à souligner, notons une matrice révisée des prises par âge, les estimations de la variance pour les prises par âge, une matrice de l'état du stock et une nouvelle analyse du recrutement.

INTRODUCTION

Preliminary estimates of nominal catch for 1985 indicate an increase from 51,469 t in 1984 to 62,758 t in 1985 (Table 1), a level exceeding the previous historical maximum. The increase in catch has been from both the USA and Canadian sectors of the fishery (Table 1); these two countries now take 99% of the total catch. A description of the fishery, including the regulations, catch, distribution of the fishery, price and industry related notes is given for the period 1960-1986 (Table 2).

The Canadian fishery for pollock is dominated by the large offshore (vessels >100' with mobile gear), and inshore (vessels <65' with mobile gear) trawler fleets, which have a combined allocation of 50% of the total TAC, and 75% of the Canadian TAC (Table 2). Nominal catches by both these fleet sectors were higher than in the previous two years, but below the gear allocation. Longline catches increased substantially and exceeded the gear allocation by 33% (Table 2). In 1985, trip limits were noted by observers as part of the Scotia-Fundy Region Observer Program (SFOP) for some of the large offshore trawler vessels. Information on the 1986 fishery suggests similar fishing pressure for pollock, but again with company imposed trip limits on the larger offshore vessels (Table 2).

Maps of the Scotian Shelf showing the distribution of catch per unit effort as recorded by the Scotia-Fundy component of the Observer Program from 1981-1986 are given in Figures 1a,b,c and from log-book records for trawlers and longliners for 1985 in Figure 1d. A comparison of these two data sets (i.e. Figures 1c and 1d) shows that a large amount of the inshore fishing activity is not covered by SFOP, especially off Southwest Nova Scotia (SWNS). indeed the lack of observer coverage in these areas is a matter of some concern for all the groundfish fisheries, because an increase in effort is less likely to come under independent observation particularly as it is now most often associated with the smaller inshore vessels. The high activity off SWNS from May to August also concurs with requests by industry to increase the allocation of pollock to vessels <65' with mobile gear, to offset the high by-catch levels of other groundfish species (Table 2; under 1985).

The landings by NAFO Areas, Subareas, and Divisions showed a marked change in 1985 (Table 3): previous spatial distribution data indicated most of the catch as coming from Divisions 4X, 5Y, and 5Z. But in 1985, there was a doubling of the catch from Division 4V where the 1980-1984 values ranged from approximately 2-6,000 t and then rose to 12,000 t. The temporal trends in the fishery however, did not change and describe a Canadian fishery where monthly catches rise to a peak between May and July and fall off again towards the end of the year (Table 4). Figures for the USA fishery show a plateau in catches from March-October and then an increase to another plateau from November to February (Table 4).

Nominal catches by gear, area, and month for the Canadian fishery (Tables 5a-h) show a marked increase in the 1985 catches by both the large offshore vessels in Division 4VW (Table 5a) and the inshore fleet in Division 4X (Table 5d). Dramatic increases in the 1985 catch by fixed gears in

Divisions 4X were also observed (Table 5f). Moreover, data for the Canadian fishery in 1986, indicates that up to June (at which point this analysis was undertaken), catches in Divisions 4VW by offshore trawlers had increased again. The advised $F_{0.1}$ catch levels for Canada in 1986 and 1987 are 40,000 t and 43,000 t (+ 1,500 t for 3Ps) (1987 Atlantic Groundfish Management Plan, DFO), but this levelling off of TACs does not take into account an increasing USA fishery. The extent of the recreational fishery in the USA was last estimated in 1980 via interviews to be landing approximately 2,000 t; circumstantial evidence suggests that it has increased since that time (Table 6).

CATCH AT AGE

A revised catch-at-age matrix was prepared for this analysis, and a description of its construction is given in CAFSAC Res. Doc. 86/119. The total catch at age and table of commercial weights-at-age are presented in Table 7.

COMMERCIAL CATCH RATES

In previous assessments, a series of commercial catch rate series were generated, but overall trends throughout were the same. Therefore, in this paper, we have simply extended the time series used to calibrate the results of cohort analysis by one year (1985) (Table 8a). This series is for Canadian OTB-1,2 Tonnage Class (TC) 5 vessels for the period June to August, where pollock was the main species recorded.

There has been some debate, however, as to the variance and final catch rate produced by large aggregative procedures (McGlade et al. 1985), i.e. using set by set data or trip by trip, wherein the main species for a trip may not have been the main species in each set. To look at this problem, we compared set/set and trip/trip catch rates by month and area from 1980 to 1985 using data from the International Observer Program (IOP) (Table 8b). The results indicated two important items: first set/set catch rates were invariably higher than trip/trip, and second, seasonal variations were very marked. The first we would expect as a result of catching other species during a trip; the second result is more interesting in that it suggests that when pollock aggregate they do so at different densities through the year. This latter issue is clearly an item that could be resolved using such alternative technologies as acoustics to survey such spatial and temporal effects.

RESEARCH SURVEY RESULTS

Canadian Research Vessel Surveys

Numbers and weight at age per standard tow were calculated for the 1970-85 summer bottom trawl surveys assuming a normal distribution for arithmetic estimates. The survey data indicate the continuous tracking of

strong year-classes throughout the Scotian Shelf including the 1968, 1969, 1971, 1975, 1979, and 1980 cohorts (Tables 9-10).

The survey catch rates, however, have spatial inhomogeneities, as evidenced in the appearance of certain year-classes in Divisions 4VW or Division 4X/SA5 exclusively. The survey catch rate for 1985 was the largest observed in the time series; the overall catch rate was high for all ages and across all strata. In 1986, the catch rate dropped to a level similar to 1984, but it was still the fourth largest in the series (Tables 9-11).

The abundance of age 4+ increased in the mid-1970s and has remained relatively high since then (Table 10).

USA Research Vessel Surveys

Numbers and weight at age per standard tow for seasonal surveys in the Gulf of Maine and Georges Bank showed similar trends to those observed on the Scotian Shelf (Tables 12a, b). Synchronicity of year-classes was apparent in all cases except the 1982 year-class which is stronger in SA5 than in Divisions 4VWX (Table 12a). Data have yet to be analyzed for the 1985 and 1986 surveys.

Inshore surveys run by the State of Massachusetts and the Northeastern Fisheries Centre consistently pick up 0 age pollock, and are thus good sources of information about recruitment in the inner Gulf of Maine. From these data the 1978, 1979, 1981, and 1982 year-classes are noted to be above average for potential recruitment to the fishery (Table 12c). This is consistent with what has been subsequently observed in the offshore surveys. The most recent inshore survey was completed in 1984.

STOCK STATUS MATRIX

Conflicting views of stock status from R.V. survey and commercial data often lead to uncertainty in the placement of recruitment and spawning stock size for projections and estimates of future TACs. Moreover, the evidence generally used in the "tuning" of cohort analysis contains only small segments of the biological parameters that are considered indicative of population status. For example, maturity and fecundity at age, occurrence of young-of-the-year (YOY) and changes in weight-at-age are key elements in the usual ecological reasoning behind density dependent effects. These characteristics should be cohesive in nature, but some are more likely to be discriminatory than others. With this in mind we have collected data from several sources to evaluate the potential for a principal components analysis of stock status; the data used include catch rate (nos/tow) in the Canadian R.V. survey (ages 1-3), catch rate (nos/tow) in the USA survey (ages 1 and 2), average weight in the commercial fishery for ages 1-4, proportion of individuals that are mature for ages 3-6 and representation in the total catch (Table 13a). Based on a principal components analysis which examines the variance in all these dimensions, year-classes separate out in a multidimensional space, represented in Table 13b. Inspection of the covariance and correlation matrices showed a high degree of independence between the variables used, and the first 5 factors represented 85% of the

total variance. Year-classes were shown to aggregate by strength, and a simple OLS with an environmental indicator based on the number of ring months of Gulf Stream anticyclonic gyres (McGlade 1986) (see RECRUITMENT), indicated that the 1983, 1984, and 1985 year-classes can already be categorized into having the potential for an average to strong signal.

PARTIAL RECRUITMENT (PR)

Yearly fishing mortalities at age from an initial cohort analysis, using the 1984 PR estimates from CAFSAC Res. Doc. 85/99 were examined for trends in time (Table 14a). For the period 1974-1978, the age of full recruitment shifted towards older fish, as if the 1967 and 1968 year-classes were being preferentially fished. From 1979-1984, the pattern was consistently flat-topped. The average PR pattern for this period was calculated assuming full recruitment at age 7 and above (Table 14b). The resulting vector of PR for 1985 is given below, together with that used for 1984:

Age	2	3	4	5	6	7+
PR^{85}	.051	.304	.619	.838	1.00	1.00
PR^{84}	.002	.30	.60	.80	1.00	1.00

Sequential Population Analyses (SPA)

The revised catch at age presented in CAFSAC Res. Doc. 86/119 was used in the cohort analysis. Natural mortality was set at 0.2 as in all previous assessments for ages 2-11; beyond this age indications of senescence have been observed (Storozhuk, 1978) thus supporting the block upon which cohort analyses were performed. Calibration of the SPA was carried out using OTB-1,2 fishable biomass against the OTB-1,2 (TC5) June to August catch-per-unit-effort (t/hr): criteria for chosing a terminal F were highest correlation coefficient, closeness of the intercept to the origin and the lowest sum of the last 5 squared standardized residuals (standardized by the mean squared error). Otter-trawl fishable biomass was established using SPA mid-year mean population biomass and an OTB PR vector computed by first examining the 1970-85 OTB partial F matrix for trends in partial recruitment. For most years the F at age was dome-shaped, with full recruitment at ages 5-7. In 1970, there was an extremely high F value for age 10 fish, which seriously affected average partial recruitment calculations, thus the years 1971-1985 were used (Table 15b). The resulting average vector for OTB-1,2 vessels is given below:

Age	2	3	4	5	6	7	8	9	10	11
PR	.017	.221	.667	.861	.941	1.00	.889	.759	.824	.689

Calibrations were carried out with O.L.S. regressions for a range of terminal F values in the cohort analysis: these went from F_t = 0.45 to 0.65 at 0.05 intervals (Table 15a). All the regressions had significant intercepts. Results are given in Table 16. A plot of fishable biomass versus commercial catch per unit effort (CPUE) (OTB-1,2 TC5 June-August) (Table 16), indicated that the 1982 point was an outlier: however, its high value of CPUE for all levels of fishable biomass was probably due to the reallocation of quotas during the summer months, rather than some intrinsic factor for the relationship. The 1982 point was therefore not included in the regressions.

The correlation coefficient was highest (0.92) at a terminal F of 0.55, declining rapidly at higher and lower levels of F. The sum of the last 5 squared standardized residuals was also minimal at this level of F. Based upon these results it was concluded that a 1985 terminal F of 0.55 was the best estimate of exploitation of the pollock stocks in this area. The results above were compared to those obtained from a similar cohort anlaysis, but one in which the catch-at-age was that given in CAFSAC Res. Doc. 85/99. The relationship and corresponding population biomasses thus obtained were not significantly different.

In conclusion, it should be noted that the current F is at the F_{max} level for this stock, and represents a significant increase in the exploitation of this resource. Similar indications have also been given by scientists at the National Marine Fisheries Service Fisheries Centre in Woods Hole (pers. comm. R. Mayo, NMFS, Woods Hole, Mass.).

ASSESSMENT RESULTS

Recruitment

The analysis of the stock status matrix indicated that the 1982 year-class was among the highest since 1968. Others in this category included the 1981, 1978, 1979, and 1980 year-classes. Based on this observation, and the correlation (r = 0.8) between anti-cyclonic gyre months and principal component scores for each year-class, the 1982 year-class at age 2 was set to be equal in size to the geometric mean abundance of these 4 year-classes from SPA, i.e. 50 million. The size of the 1983 year-class at age 2 estimated from the SPA was the second smallest observed. However, the correlation above indicated it to be equal to the geometric mean of age 2 abundance from 1970-1983, i.e. 34 million.

Stock Size

The highest observed values of age 2+ beginning of the year population numbers for the time series were in 1981 and 1982 (154 million). Estimates for recent years are lower but remain close to the long term average of 114 million fish. It is not clear, however, whether current levels of F, which are at F_{max} will substantially impact stock sizes in the future.

Yield Per Recruit

It has been suggested that recruitment variability has some implications for yield-per-recruit calculations, thus an analyses to look at the effects was undertaken using the recruitment series from SPA (age 2). Based on partitioning of the time series and establishment of a probability distribution of year-class size across partitions, a matrix of recruitment vectors was produced through random number allocation between and within partitions. Convergence to 3 decimal places between the original and generated probabilities occurred after 300 runs. These data, together with associated year-class effects on weight were used to generate yield-per-recruit curves over a range of fishing mortalities. The results indicated a slight decline in the $F_{0.1}$ value of .288 to .281 after 3000 simulations suggesting a stable population in response to population size changes.

PROGNOSES

Given the increased effort by the USA in Subarea 5, it is clear that the overall $F_{0.1}$ strategy for pollock is unduly impinging upon the Canadian fishery given the fact that 75% of the resource lies to the east of the ICJ line in Canadian waters, but only 66% of the TAC is taken by Canadian vessels. Catch projections for this stock were therefore, amended to take into account the expanding USA fishery, first by acknowledging the increased proportion of fish landed by the USA and secondly by assuming that this trend is unlikely to change. These projections were made using average weights at age for 1985 from the commercial fishery, a PR vector for the population from 1979-84, setting the 1983 and 1984 year-classes at the geometric mean of 34 million fish and the 1982 year-class at 50 million fish. The TAC for 1986 was set at 60,000 t, the most realistic estimate of the catch and at $F_{0.1}$ = 0.28 in 1987. The analysis examined the effects of keeping the partial F exerted by the USA fishery at the same level as that in 1985 for the 1986 and 1987 fishery. The remaining F was attributed to Canada and the projected catches examined. Another part of the analysis looked at reducing the overall F from F_{max} (where the fishery is now) to $F_{0.1}$ over a two year period. Because the catch in 1986 is expected to be at least 60,000 t this step down strategy would have to apply to the 1987-1988 fishery. In 1987, the F would be approximately 0.415 and the F in 1988 would be the $F_{0.1}$ level of 0.28.

Input data for these projections as as follows:

Age	1985 Population Numbers ('000)	1985 Catch at Age ('000)	Weight at Age (kg)	Partial Recruitment	USA Partial F 1985-87	Can. Catch(a) 1986-87
2	34,000	224	0.73	0.05	.0001	$TCa \cdot (1 - \frac{USAF}{Total\ F})$
3	40,291	2,335	1.05	0.30	.0034	
4	11,042	2,903	1.92	0.62	.027	
5	17,212	5,803	2.75	0.84	.059	
6	20,918	8,094	3.23	1.0	.068	
7	3,627	1,408	3.73	1.0	.062	
8	551	213	5.13	1.0	.12	
9	613	237	6.36	1.0	.126	
10	896	347	6.34	1.0	.107	
11	339	131	6.65	1.0	.12	

The $F_{0.1}$ catch in 1987 would be 30,000 t, with the USA catching approximately 8,000 t on the assumption that their level of effort would be the same as from that expended in 1985.

The results indicate that a severe reduction in Canadian effort would be required to achieve even an $F_{0.1}$ strategy within two years, and stress the overriding need for a rationalization of the allocation of resources of pollock both within Canada and between Canada and the USA. Given the Canadian allocation for 1985, 1986, and 1987 as remaining more or less constant (42,400 t; 40,000 t; and 43,000 t with 1,500 t for Division 3PS) it is unclear as to whether or not this resource will be given the opportunity to go through any such phase of low exploitation.

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Table 1. Pollock Landings (t round fresh) by Country for Divisions 4VWX and Subareas 5 and 6, 1960 - 1985.

Year	Canada	Fed. Rep. Germany	German Dem. Rep.	Japan	Spain	USSR	United Kingdom	U.S.A.	Other	Total
1960	29470	-	-	-	783	-	-	10132	1	40386
1961	26323	-	-	-	982	-	-	10265	1	37571
1962	31721	-	-	-	-	-	-	7391	-	39112
1963	28999	126	-	-	-	906	28	6653	-	36712
1964	30007	208	-	-	-	4603	374	6006	55	41253
1965	27316	71	-	-	1361	2667	11	5303	-	36729
1966	18271	-	-	-	2384	9865	12	3791	-	34323
1967	17567	-	-	-	1779	644	1	3312	14	23317
1968	18062	-	-	-	1128	372	-	3280	7	22849
1969	15968	1188	2195	-	1515	227	-	3943	7	25043
1970	10753	3233	4710	40	532	527	-	3976	-	23771
1971	11757	633	6849	15	912	2216	-	4890	3	27275
1972	18022	475	4816	8	616	3495	4	5729	54	33219
1973	26990	1124	948	1570	3113	3092	-	6303	36	43176
1974	24975	149	2	40	1500	2348	48	8726	14	37802
1975	26548	236	96	-	709	2004	-	9318	124	39035
1976	23568	994	24	-	303	1466	-	10863	390	37608
1977	24654	368	-	1	2	268	-	13056	53	38402
1978	26801	-	-	110	-	502	-	17714	180	45307
1979	29967	7	-	19	-	1025	-	15541	72	46631
1980	35986	-	-	81	-	950	-	18280	131	55428
1981	40270	-	-	15	-	358	-	18171	90	58904
1982	38029	-	-	3	-	297	-	14357	128	52814
1983	32749	-	-	6	-	226	-	13967	283	47231
1984*	33419	-	-	1	-	118	-	17762	169	51469
1985*	42971	-	-	18	-	336	-	19367	66	62758

* Data from DFO Statistics Branch, provisional data for countries other than Canada.

Table 2. Description of the pollock fishery in Divisions 4VWX and SA 5.

	GOVERNMENT		FISHERY		INDUSTRY	
Year	Catch	Regulations (t)	Percentage of Catches	Price ¢/lb	Distribution of Catches	Trip Limits
1960-72		-	Mixed groundfish; Can., USA and DWF.	= 3.0 = 4.5	Predominately 4X	-
1973	43K	Preemptive TAC 50K; 4X and SA5	Mixed groundfish; Can. 63%, USA 14%; DWF 23%; 33% Can. 4X (OTB TC 1-3); USA western Gulf of Maine.	= 7.5	=.33 SA5 =.66 SA4	-
1974	38K	TAC 55K; 4VWX+5, Can. 34K; For. 21K	Directed; Can. 65%; USA 23%; DWF 12%; 50% of Can. in 4X (OTB); 10% 4X (GN).	= 8.5	=.33 SA5 =.66 SA4	-
1975	39K	TAC 55K; 4VWX+5; Can. 33.5K; For. 21.5K	Directed; Can. 67%; USA 23%; DWF 10%; Catch rates and effort increased; 60% of Can. in 4X (OTB); 15% 4X (GN).	= 7.5	=.33 SA5 =.66 SA4	-
1976	38K	TAC 55K; 4VWX+5; Can. 33.5K; For. 21.5K	Directed; Can. 65%; USA 30%; DWF 15%; 54% Can. in 4X (OTB); 19% 4X (GN).	=11.0	=.33 SA5 =.66 SA4	-
1977	38K	TAC 30K; 4VWX+5; Can. 20.975K; For. 9.025K; 200 mile limit imposed	Directed; Can. 65%; USA 34%; DWF 1%; Can. 30% 4VW, 60% 4X (OTB), and 10% 4X (GN); Can. > allocation 19%.	=12.0	=.42 SA5 =.38 SA4	-
1978	45K	TAC 30K; 4VWX+5; Can. 20.975K; For. 9.025K	Directed; Can. 60%; USA 40%; DWF less than 1%; Can. 22% 4VW, 52% 4X (OTB), 20% 4X (GN); 40% USA (GN); Can. > allocation 28%.	=13.0	=.5 SA5 =.5 SA4	-
1979	47K	TAC 30K; 4VWX+5; Can. 22.32K; For. 7.68K; *treaty % 74.4% Can.; 25.6% USA; begin vessels less than 27.4 report catches	Directed; Can. 65%; USA 34%; DWF less than 1%; Can. 27% 4VW, 43% 4X (OTB), 23% 4X (GN); 40% USA (GN); Can. > allocation 27%; fishery closed 30 August when Can. 30K (alloc. 22K).	=15.5	=.40 SA5 =.60 SA4	-
		*Treaty signed 29 March, but did not enter into force, although alloc. made accordingly.				
1980	55K	TAC 40K*; 4VWX+5; Can. 29.76K; For. 10.24K; treaty % 74.4% Can.; 25.6% USA;	Directed; Can. 65%; USA 34%; DWF less than 1%; Can. 28% (OTB TC 4+), 18% (TC 1-3) 4X; 25% 4VW (OTB); 25% 4X (GN); USA 40% (GN); Can. > allocation 16%.	=19.5	=.42 SA5 =.58 SA4	-

Table 2. (Continued)

	GOVERNMENT		FISHERY		INDUSTRY	
Year	Catch	Regulations (t)	Percentage of Catches	Price ¢/lb	Distribution of Catches	Trip Limits
		Can. F.G. 8.76K M.G. <125' 5K M.G. >125' 1 Jan-Oct 14 15.8K 15 Oct-Dec 31 2.1K	M.G. <125' cl. 18 Aug; op. 9 Oct; cl. 9 Nov M.G. >125' cl. 31 Mar; op. ?; cl. 12 July; op. 15 Oct given 3K; cl. 16 Nov			
		*Interim TAC 30K				
1981	59K	TAC 54K*; 4VWX+5; Can. 29.76K (40.16K*); For. 10.24K (13.84K*); treaty 74.4% Can.; 25.6% USA;	Directed; Can. 69%; USA 30%; DWF less than 1%; Can. 25% 4X, 34% 4VW (OTB TC 4+), 14% 4X (TC 1-3), 18% 4X 7% 4VW (GN); USA 40% (GN); Can. greater allocation 35%.	=22.0	=.37 SA5 =.63 SA4	-
		Can. F.G. (8.76K) 8.76K M.G. <125' (7K) (+1.5K) 8.5K M.G. >125' J-O (10.5K) (+8.4K*) 22.9K O-D (3.5K)	M.G. >125' cl. 15 Apr.; op. 15 Oct.		F.G. 6.5K (74%) M.G.<125' 7.2K (84%) >125' 23.8K (104%)	
		*Originally 40K; increased 04/09/81 10.4K alloc. to Can. (0.5K put into reserve); 3.6K USA.				
1982	53K	TAC 55K; 4VWX+5; Can. 43K; USA 12K; treaty 74.4% Can; 25.6% USA	Directed; Can. 72%; USA 28%; DWF less than 1%; Can. 25% 4VW, 23% 4X (OTB TC 4+), 19% 4X (TC 1-3); 25% 4X (GN); USA 40% (GN); Can. less allocation 12%.	=24.0	=.37 SA5 =.64 SA4	-
		Can. F.G. (10.5K) 11.5K M.G. >100' (24K) 22K 65-100' (0.5K) 0.5K <65' (8K) 9K	M.G. <65' cl. 8 Oct; op. 13 Nov		F.G. 10.24K (89%) M.G. >100' 19.0K (87%) 65-100' .22K (44%) <65' 8.3K (92%)	
		Vessels greater than 65' sector management; company quotas				
1983	47K	TAC 45K*; 4VWX+5; Can. 45K; USA (5K); treaty 74.4% Can.; 25.6% USA	Directed; Can. 70%; USA 30%; DWF greater than 1%; Can. 26% 4VW, 17% 4X (OTB TC 4+), 27% 4X (TC 1-3); 20% 4X (GN).	=26.0	=.38 SA5 =.62 SA4	(Dec) Discouraging fishing for pollock because of low market value, 20,000 lbs limit except if sold fresh.
		*Revised to 50K mid-year following new advice				

Table 2. (Continued)

	GOVERNMENT		FISHERY		INDUSTRY	
Year	Catch	Regulations (t)	Percentage of Catches	Price ¢/lb	Distribution of Catches	Trip Limits
		Can. F.G. (10.6K) 10.69K M.G.>100' (22.4K)(+1.09K) 21.4K 65-100' (.25K)(+.03K) 0.28K <65' (7.75K)(+.88K) 9.63K	M.G. 65-100' cl. July 30		F.G. 8.2K (77%) M.G.>100' 14.8K (69%) 65-100' .23K (83%) <65' 9.5K (99%)	
1984	51K	TAC 53K; 4VWX+5; Can. 42.4K; USA 10.6K; treaty 74.4% Can; 25.6% USA;	Directed; Can. 65%; USA 35%; DWF greater than 1%; Can. 20% 4VW, 7% 4X (OTB TC 4+), 31% 4X (TC 1-3); 14% 4X (GN); Can. < allocation 22%	≈20.0	≈.39 SA5 ≈.61 SA4	Possible discards due to non-payment or suspension if trip limits exceeded 20,000 lbs early on in 4V; +200,000 lbs Mar-Jun; < 50,000 lbs June; 125,000 lbs Oct-Dec.
		F.G. (10.17K) 8.97K M.G.>100' (23.75K) 19.45K 65-100' (.27K) .77K* <65' (8.21K) 13.21K	M.G.<65' 4X from Cape Forchu to Cape Sable cl. 22 May; op. June 1 M.B.<65' cl. 30 July; op. 2 Sept Ent. Alloc. Pierce Fisheries Ltd. cl. 17 Oct		F.G. 7K (79%) M.G.>100' 12K (63%) 65-100' 65K (84%) <65' 13.8K (104%)	
1985	63K	TAC 53K; 4VWX+5; Can. 42.4K; USA 10.6K; treaty 74.4% Can., 25.6% USA	Directed; Can. 70%; USA 30%; Can. 27% 4VW, 5% 4X (OTB TC 4+), 36% (TC 1-3) 4X, 25% 4X (GN); Can. greater alloc. 1%	≈18.0	≈.33 SA5 ≈.66 SA4	30-125,000 lbs throughout year very high catch rates in the Gully in Jan-Mar
		F.G. (10.17) 8.37K M.G.>100' (23.75K) 17.35K 65-100' (.27K) .47K <65' (8.21K) 16.21K	F.G.<65' cl. 16 Nov; op. 28 Nov M.G.<65' cl. 29 June; op 8 July, cl. 27 July 20% bc; 13 Aug 10% bc; 30 Aug 35% bc; 16 Nov 10% bc		F.G. 11.13K (133%) M.G.>100' 15.8K (91%) 65-100' .42K (89%) <65' 15.14K (94%)	

Table 2. (Continued)

Year	GOVERNMENT Catch	GOVERNMENT Regulations (t)	FISHERY Percentage of Catches	Price ¢/lb	INDUSTRY Distribution of Catches	INDUSTRY Trip Limits
1986		TAC 40K; 4VWX+5; Can. 40K; treaty 74.4% Can.; 25.6% USA	Directed;	=0.24		Trip limits in place 75-100,000 lbs
		F.G. (11K) 9.55K M.G.>100' (20K) 18.8K 65-100' (.25K) .25K <65' (8.75K*) 11.4K	M.G.<65' cl. 27 Mar (trip limit 4.5t); cl. 7 Apr (10% bc).; 27 Apr. alloc. +13.6t; 6 May (tl 22.5t); 14 June (tl 4.5t); 23 June (tl 1.5t); 18 July (tl 1.5t or 10% bc); cl 25 Aug OT tl 10% bc); 31 Aug (tl. 1t or 10% bc)		F.G. 9.4K (98%) M.G.>100' 14.6K* (78%) 65-100' .25K (99%) <65' 7.9K (69%) *1.2K Nfld. 13.5K S-F	
		**Jan-Apr. 1.3K; May-Aug 5.65K; Sept-Dec 1.8K Changed mid-year: Jan-Apr. 2.97K; May-Aug 5.26K; Sept-Dec 1.31K				

Table 3. Pollock landings (t, round fresh) for Divisions 4VWX, Subarea 5, and Statistical Area 6, 1960-85. (1986 data not available.)

Year	4V	4W	4X	Total 4VWX	5Y	Total 5Z	5NK	Total SA 5	SA 6	Total
1960	1503	8354	20132	29989	6545	3834	18	10397	-	40386
1961	1864	13167	14321	29352	5017	3177	25	8219	-	37571
1962	1292	12045	19624	32961	2560	3576	15	6151	-	39112
1963	674	9152	20645	30471	2168	3947	10	6125	116	36712
1964	474	12488	19283	32245	1754	7250	-	9004	4	41253
1965	1205	13134	13390	27729	1933	7065	-	8998	2	36729
1966	788	11040	12648	24476	953	8846	-	9799	48	34323
1967	657	5836	8290	14783	1728	6790	14	8532	2	23317
1968	1013	5954	10656	17623	1416	3806	-	5222	4	22849
1969	300	3938	10983	15221	4635	5187	-	9822	-	25043
1970	649	2952	8194	11795	6281	5280	-	11561	415	23771
1971	531	1802	9739	12072	7016	7238	58	14312	891	27275
1972	597	3419	16190	20206	6419	6570	-	12989	24	33219
1973	1004	5871	23225	30100	5202	7853	-	13055	21	43176
1974	307	4740	20362	25409	6106	6238	-	12344	49	37802
1975	799	5697	18668	25164	6015	7851	-	13866	5	39035
1976	1102	3424	19700	24226	6441	6926	12	13379	3	37608
1977	1347	6082	14700	22129	8278	7925	36	16239	34	38402
1978	2931	4910	15161	23002	12238	9960	91	22289	16	45307
1979	4877	4963	18340	28180	9856	8367	221	18444	7	46631
1980	3893	7511	20485	31889	11388	11903	245	23536	3	55428
1981	2316	15678	18842	36836	12475	9319	247	22041	27	58904
1982	2939	9373	21036	33348	9416	9918	129	19463	3	52814
1983	5491	5787	18137	29415	8458	9242	113	17813	3	47231
1984**	5625	5909	19349	31002*	12530	7788	149	20467	-	51469*
1985**	11890	2801	26524	41799*	846	894	19219	20959	-	62758*

* Includes NK

** Data from DFO Statistics Branch, provisional data for countries other than Canada.

Table 4. Pollock landings (t round fresh) by month and country for NAFO Divisions 4VWX - 5 - 6. (1986 data not available.)

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (plus NK)
						CANADA (Maritimes and Newfoundland)							
1972	204	993	296	930	1004	3084	3718	1192	1755	2188	2191	467	18022
1973	498	981	1521	2922	2135	4785	3239	3403	2331	2181	1955	1039	26990
1974	288	187	869	1012	1986	3730	5073	2206	2202	1634	2461	3327	24975
1975	333	230	475	2021	1524	2920	2736	3691	2312	2833	2993	4480	26548
1976	297	263	445	1498	2604	4270	3814	2327	2347	1669	1413	2621	23568
1977	1062	1749	2271	1859	1006	2202	2097	2003	2304	1333	2309	4459	24654
1978	2511	3265	1864	2070	3425	2772	2755	1228	1262	839	706	4104	26801
1979	935	1536	1523	1970	2597	4664	4850	3389	1866	1645	1486	3506	29967
1980	1465	3037	2441	1903	3511	5501	5382	3095	2220	3617	2014	1800	35986
1981	2562	1811	3421	2054	1193	2363	2671	3380	4632	2462	4831	8890	40270
1982	2745	1010	1296	1075	2480	5298	5620	5348	3926	3122	2389	3720	38029
1983	1837	1265	1471	2349	6315	5842	5430	3883	2446	1125	528	258	32749
1984*	369	522	1525	2649	3069	6161	5808	3485	2997	3108	1583	1963	33419
1985*	1414	1926	2628	4437	2751	6108	7894	3837	3885	3376	3109	1606	42971
						U.S.A.							
1972	455	318	228	229	201	394	329	294	314	488	1082	1397	5729
1973	419	313	311	406	331	418	335	302	262	573	1112	1519	6303
1974	946	558	508	650	479	388	644	570	480	661	1097	1385	8726
1975	740	721	486	594	477	924	684	743	765	598	1110	1061	9318
1976	706	658	501	665	936	1035	985	800	1125	669	813	1305	10863
1977	1017	661	460	817	1061	1038	1351	1149	933	926	1189	1709	13056
1978	884	1065	1035	1394	1150	1347	988	1593	925	1251	2665	2620	17714
1979	1196	434	505	753	1298	1332	1252	1706	1392	1352	1876	1605	15541
1980	1001	1093	705	977	1534	1437	1603	1536	1501	1285	1961	2276	18280
1981	1851	1093	946	1230	1444	1300	1127	1044	820	1645	2661	2738	18171
1982	818	762	909	768	864	889	1433	1102	1314	1365	2147	1798	14357
1983	1041	740	676	648	1112	1843	1491	1306	881	1030	1554	1491	13967
1984**	1589	1183	980	883	1198	1104	1305	1160	1077	1526	2323	3285	17762
1985**	2461	2255	1221	1243	939	1496	1123	-	1218	1343	-	2706	19367
						OTHERS							
1972	599	481	440	686	538	627	867	270	183	47	385	4301	9468
1973	513	1808	442	966	48	818	117	367	700	407	1996	1701	9883
1974	77	579	165	134	751	235	612	464	412	228	176	268	4101
1975	154	382	312	129	645	339	234	51	195	156	327	245	3169
1976	33	129	273	312	228	266	257	275	659	543	113	89	3177
1977	-	2	108	43	398	96	11	17	5	8	2	2	692
1978	16	14	1	9	110	208	190	135	7	92	2	8	792
1979	-	19	3	10	705	226	101	4	48	3	4	-	1123
1980	5	53	12	153	549	264	47	14	9	27	29	-	1162
1981	26	38	24	49	114	108	80	14	8	2	-	-	463
1982	10	9	5	-	205	122	75	1	1	-	-	-	428
1983	8	10	-	16	356	107	12	6	-	-	-	-	515
1984*	23	8	15	41	85	100	13	2	-	-	-	1	288
1985*	0	0	0	5	117	251	25	13	0	0	6	3	420

* Data from DFO Statistics Branch, provisional data for countries other than Canada.

** From NMFS data tapes

Table 5a. Nominal catches of pollock in NAFO Division 4VW for Canadian (Maritimes and Quebec) OTB-1, 2 (otter trawls), TC (tonnage class) 4 and over combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	412	419	159	351	3584	1367	47	151	110	59	549	3107	10315
65	535	1034	505	571	2439	1320	34	2	10	1144	3052	927	11573
66	146	130	355	548	1385	474	0	29	355	223	610	673	4928
67	281	103	386	271	316	19	211	1075	255	930	91	529	4467
68	224	284	928	625	1017	960	34	62	39	87	551	492	5303
69	486	280	320	172	384	62	73	14	1	22	51	302	2167
1970	584	230	384	323	127	12	71	1	23	56	15	44	1870
71	116	87	218	195	22	16	9	16	50	33	40	85	887
72	53	31	138	187	16	57	1	15	63	138	105	239	1043
73	124	131	197	254	226	42	0	8	29	159	1228	757	3155
74	118	41	454	75	73	571	143	323	244	51	53	280	2426
75	193	112	43	874	359	82	408	45	106	402	660	607	3891
76	16	39	55	305	218	250	187	80	178	402	279	221	2230
77	81	87	345	397	175	362	192	627	1051	322	655	2500	6794
78	1758	193	773	758	797	431	605	211	36	144	74	119	5899
79	121	282	421	507	702	1419	1204	1683	38	483	523	666	8049
1980	584	636	615	480	371	1191	1924	363	243	1027	1100	865	9399
81	1971	252	927	753	439	442	343	118	703	546	1973	5195	13662
82	1902	76	388	293	402	543	860	1238	172	241	762	2858	9735
83	468	18	197	1167	2340	1606	934	1134	547	225	195	62	8893
84	112	115	689	1164	612	1086	797	596	649	1179	408	1314	8721
85	1072	474	930	988	682	627	1777	601	663	1112	1880	859	11665
86	212	1820	1202	1338	1151	354	-	-	-	-	-	-	6077

Table 5b. Nominal catches of pollock in NAFO Division 4X and Subarea 5 for Canadian (Maritimes and Quebec) OTB-1, 2 (otter trawls), TC (tonnage class) 4 and over combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	310	186	589	956	816	784	314	74	157	207	2644	415	7452
65	304	1369	843	851	646	408	93	36	167	2078	755	463	8013
66	657	770	740	1129	637	417	383	122	595	272	436	942	7100
67	978	1169	1907	868	432	276	659	535	626	653	456	71	8630
68	146	295	789	1033	266	427	620	518	188	306	689	285	5562
69	452	593	359	641	293	240	598	892	137	2008	469	70	6752
1970	211	226	86	166	345	1213	183	124	299	877	349	56	4135
71	108	315	74	422	730	1580	650	513	269	1085	536	183	6465
72	141	952	136	232	798	2280	2220	502	1012	1364	1575	187	11399
73	314	627	913	1405	792	1660	683	1092	1145	1531	553	10	10725
74	145	101	384	427	1238	1545	2858	709	1133	1140	2073	1618	13371
75	128	95	337	482	280	2089	1270	2060	1146	1529	1804	882	12102
76	244	195	253	185	1581	1768	1364	705	935	406	952	453	9041
77	974	1610	1328	933	272	506	497	247	79	378	1206	998	9028
78	502	2785	944	445	1390	1213	687	75	39	230	378	1758	10446
79	766	1124	745	779	345	1576	1289	36	225	247	182	328	7642
1980	737	2128	1186	256	240	2056	835	278	377	1156	434	413	10096
81	330	1154	1878	861	84	225	20	229	1089	68	1610	2189	9737
82	778	701	76	73	61	2236	676	672	379	1620	1136	530	8938
83	1096	866	819	85	186	1357	704	403	174	95	51	76	5912
84	63	83	556	26	75	1085	257	146	54	113	196	201	2855
85	70	370	131	9	78	428	129	194	137	39	366	334	2285
86	893	319	87	27	57	362	-	-	-	-	-	-	1745

Table 5c. Nominal catches of pollock in NAFO Division 4VW for Canadian (Maritimes and Quebec) OTB-1, 2 (otter trawls), TC (tonnage classes) 1, 2, and 3 combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	0	0	0	23	382	38	10	0	0	14	0	0	467
65	4	6	24	45	92	67	1	0	0	31	0	0	270
66	0	0	11	90	175	44	0	2	41	33	5	0	401
67	2	0	2	0	0	1	0	0	0	0	0	0	5
68	0	1	0	0	0	0	0	0	0	0	0	0	1
1970	1	2	5	0	0	0	0	0	0	0	0	0	8
71	0	0	1	3	0	0	0	0	0	0	0	0	4
72	0	0	0	0	1	0	0	8	1	0	0	0	10
73	0	0	0	0	0	0	0	0	0	0	2	0	2
74	0	0	0	0	12	9	14	4	17	3	20	0	79
77	0	0	0	0	2	0	0	0	0	0	0	0	2
78	0	1	0	8	11	12	0	0	2	0	0	0	34
79	0	0	0	0	2	2	0	4	0	0	0	2	10
1980	0	1	1	0	39	58	30	16	2	17	0	0	164
81	8	3	3	18	67	125	87	41	27	19	3	1	402
82	0	0	31	27	32	47	55	86	33	48	10	2	371
83	0	17	9	58	46	56	24	44	14	4	6	1	279
84	0	2	19	95	31	345	136	75	111	55	26	59	954
85	0	46	36	106	79	48	10	5	34	15	2	35	416
86	12	14	284	68	455	143	-	-	-	-	-	-	976

Table 5d. Nominal catches of pollock in NAFO Division 4X and Subarea 5 for Canadian (Maritimes and Quebec) OTB-1, 2 (otter trawls), TC (tonnage classes) 1, 2, and 3 combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	9	42	126	357	392	641	572	339	403	190	448	8	3527
65	24	365	233	668	755	417	449	363	513	445	80	6	4318
66	6	56	201	743	283	438	742	538	329	75	24	8	3443
67	24	46	132	563	148	314	461	464	262	176	13	14	2617
68	6	26	252	361	419	747	985	611	495	365	72	41	4380
69	11	57	69	106	392	634	1434	428	223	228	36	3	3621
1970	19	37	149	171	312	575	889	369	256	167	52	9	3005
71	1	13	16	215	268	483	727	232	249	391	54	24	2673
72	8	3	18	511	160	448	1077	364	370	372	159	1	3491
73	51	204	409	1258	1056	2385	1907	1414	391	143	83	1	9302
74	19	22	17	504	587	872	1251	688	371	154	33	33	4551
75	7	22	71	645	765	401	559	885	439	358	38	1	4191
76	0	14	88	937	506	890	790	658	354	290	62	9	4598
77	1	43	503	349	220	687	762	555	411	193	202	2	3928
78	6	207	65	677	710	424	632	421	685	230	43	3	4103
79	2	87	291	489	1072	973	1146	852	666	317	182	5	6082
1980	23	136	533	848	1029	1106	1370	633	212	546	55	30	6521
81	60	281	319	316	399	944	963	1008	511	651	238	176	5866
82	15	218	293	204	1330	964	1697	870	1119	503	76	53	7349
83	236	297	147	755	1958	2705	1794	454	523	195	80	69	9213
84	158	212	198	1223	1903	2550	3061	931	898	1243	722	131	13230
85	182	889	1328	2991	915	3310	3855	444	463	578	229	73	15257
86	124	1270	1955	438	2296	1294	-	-	-	-	-	-	7377

Table 5e. Nominal catches of pollock in NAFO Division 4VW for Canadian (Maritimes and Quebec) gillnets, longlines, and other gears, TC (tonnage classes) 1, 2, and 3 combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	5	6	25	78	49	89	331	220	159	60	39	25	1086
65	0	1	0	0	0	25	172	93	46	26	4	1	368
66	0	0	0	0	1	62	96	54	35	19	0	0	267
67	0	0	0	0	1	28	108	65	33	49	13	0	297
68	0	0	0	0	0	41	70	202	179	52	18	1	563
69	0	0	0	0	1	50	158	167	374	229	38	2	1019
1970	0	0	0	0	2	12	9	23	99	87	38	0	270
71	0	0	0	0	5	23	35	55	30	24	18	0	190
72	0	0	0	0	1	24	41	71	98	64	8	0	307
73	0	0	0	1	2	9	35	55	61	66	5	7	241
74	0	0	0	0	1	33	24	47	87	32	16	4	244
75	0	0	0	0	1	2	10	66	28	19	15	16	157
76	0	0	0	1	0	19	46	34	50	49	6	0	205
77	0	0	1	1	14	9	32	12	94	53	37	1	254
78	1	4	1	0	16	219	72	28	95	24	6	0	466
79	0	3	4	9	61	44	52	117	61	59	63	26	499
1980	21	17	1	4	17	10	23	159	26	136	24	16	454
81	33	9	1	0	11	36	155	533	1690	107	21	169	2765
82	15	2	30	6	60	122	245	349	290	190	75	1	1385
83	2	11	33	20	38	100	284	363	373	133	80	1	1438
84	2	8	-	3	32	41	156	484	242	102	51	1	1121
85	2	5	9	18	135	110	75	199	219	131	7	1	911
86	0	76	84	77	42	78	-	-	-	-	-	-	357

Table 5f. Nominal catches of pollock in NAFO Division 4X and Subarea 5 for Canadian (Maritimes and Quebec) gillnets, longlines, and other gears, TC (tonnage classes) 1, 2, and 3 combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	20	41	54	281	590	1384	1476	1013	839	457	184	50	6389
65	53	1	44	113	204	419	903	442	284	206	60	1	2730
66	2	3	2	8	95	534	801	386	151	80	15	2	2079
67	3	2	2	52	37	308	401	283	222	135	66	0	1511
68	0	1	1	6	158	526	506	355	347	276	36	2	2214
69	1	0	3	6	126	620	544	390	277	226	176	19	2388
1970	1	1	2	6	41	250	329	170	190	250	196	23	1459
71	0	1	2	2	27	344	318	288	206	167	123	47	1525
72	1	2	2	0	28	275	378	232	211	250	344	40	1763
73	3	1	1	4	59	689	614	834	705	282	84	264	3540
74	4	12	3	5	74	700	781	435	350	254	266	1392	4276
75	5	1	24	19	92	342	489	634	592	525	476	2974	6173
76	35	14	49	64	287	1343	1420	850	828	522	114	1937	7463
77	1	7	75	173	322	635	609	560	648	351	209	958	4548
78	23	40	49	48	279	411	636	492	405	207	181	2217	4988
79	15	28	48	111	363	638	876	682	859	520	535	2478	7163
1980	100	58	65	269	1710	1180	1121	1630	1350	669	287	458	8897
81	133	68	241	94	155	589	1103	1451	611	1071	968	578	7062
82	25	8	306	399	561	1111	2084	2130	1926	503	265	269	9587
83	30	24	239	261	390	779	1813	1667	941	493	138	51	6826
84	33	102	52	83	256	940	1293	1254	1043	416	180	255	5907
85	77	117	151	245	709	1485	1723	2339	2192	1322	229	131	10720
86	115	159	109	344	191	1197	-	-	-	-	-	-	2115

Table 5g. Nominal catches of pollock in NAFO Division 4VW for Canadian (Maritimes and Quebec) gillnets, longlines, and other gears, TC (tonnage class) 4 and over combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	0	1	0	0	0	0	0	0	0	0	0	0	1
1973	0	2	0	0	0	0	0	0	0	0	0	0	2
74	0	2	1	0	0	0	0	0	0	0	0	0	3
75	0	0	0	1	0	0	0	0	0	0	0	0	1
76	0	0	0	0	8	0	1	0	0	0	0	0	9
77	0	0	14	3	1	0	0	0	4	14	0	0	36
78	214	16	0	72	91	38	102	0	0	0	0	6	539
79	22	0	0	0	0	0	0	1	0	0	0	0	23
1981	0	0	0	1	0	0	0	0	1	0	0	0	2
82	0	0	0	0	0	0	0	2	2	0	0	0	4
84	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	-	-	-	-	-	-	0

Table 5h. Nominal catches of pollock in NAFO Division 4X and Subarea 5 for Canadian (Maritimes and Quebec) gillnets, longlines, and other gears, TC (tonnage class) 4 and over combined. Data for 1986 available up to mid-June.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1964	3	0	3	74	113	130	111	98	73	66	67	13	751
65	0	0	0	0	0	0	0	1	0	0	0	0	1
1970	0	0	0	0	0	0	0	0	0	3	0	0	3
76	0	0	0	0	2	0	6	0	2	0	0	0	10
77	5	1	3	3	0	3	5	0	0	22	0	0	42
78	0	15	9	20	56	20	20	0	0	0	19	0	159
1982	0	0	0	0	0	0	0	0	4	0	0	0	4
83	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	-	-	-	-	-	-	0

Table 6. Numbers, total weight, and estimated mean weight (kg) of pollock taken by USA recreational fishermen by area, 1960-1980 (source Mayo and Clark 1984).

Year	Area				Totals		
	ME	NH	MA	RI-VA	Number (000's)	Weight (tons)	Mean Weight (kg)
1960	-	-	-	-	4335	9834	2.27
1965	-	-	-	-	3756	4240	1.13
1970	-	-	-	-	2451	2533	1.03
1974	146	81	211	43	481	496	1.03
1980	80	631	3619	102	4432	2127[2]	0.48
	(36)[1]	(284)	(1630)	(46)	(1996)	(958)	

[1] Numbers in parentheses exclude data for pollock caught and released alive.

[2] Calculated by multiplying numbers caught by mean weight of pollock available for identificaion in intercept (creel) survey work.

Table 7. Commercial catch at age and weight at age.

TOTAL CATCH AT AGE 14/

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	0	0	0	0	0	0	0	0	0	8	0	0	0	2	0	0
2	94	1451	799	1434	257	258	247	57	115	300	345	697	261	82	64	224
3	384	2463	2171	2626	7341	1450	2183	1782	1549	4072	669	2754	5042	2684	1203	2335
4	1282	2348	3177	9253	3482	5354	3079	3874	3646	7455	3766	1305	2246	11271	5218	2902
5	1052	2003	1737	5206	3077	2570	5277	2452	3696	4509	6733	3839	843	1853	9873	3803
6	829	1579	922	722	1399	2405	1444	2962	1872	2192	4116	4732	2604	421	1253	8094
7	911	562	484	285	405	1037	1331	1043	2083	750	1516	2777	2630	689	205	1403
8	785	230	111	110	208	261	277	664	602	537	472	965	1348	987	371	213
9	289	2	236	245	99	82	43	196	410	160	335	304	554	545	325	237
10	200	6	170	93	92	85	36	81	157	62	110	271	266	279	193	347
11	108	1	60	14	75	56	24	46	104	40	33	63	181	132	60	131
12	24	1	95	5	37	49	67	277	230	113	79	148	219	266	135	176

TOTAL WEIGHT AT AGE 14/

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.63	0.00	0.00
2	0.49	0.79	1.06	0.52	0.83	0.86	0.61	0.83	0.84	0.73	0.75	0.62	0.57	0.72	1.02	0.73
3	1.59	1.69	1.86	1.28	1.39	1.28	1.23	1.14	1.23	1.19	1.50	1.47	1.11	1.15	1.47	1.05
4	2.37	2.13	2.53	1.93	1.95	1.98	1.91	1.59	1.80	1.44	2.05	2.42	2.55	1.66	2.15	1.92
5	3.37	3.16	4.32	2.85	3.00	3.08	2.75	2.60	2.67	2.72	2.71	2.95	3.51	3.06	2.63	2.75
6	3.70	4.00	5.29	3.96	4.08	3.85	3.67	3.83	3.94	3.52	3.81	3.43	4.15	4.16	3.51	3.23
7	4.59	4.99	5.95	4.86	5.06	5.09	4.59	4.56	4.63	4.65	4.21	4.39	4.51	4.98	5.14	3.73
8	5.70	5.24	6.52	6.25	6.10	6.55	5.55	5.66	5.79	5.66	5.65	5.83	5.27	5.18	5.75	5.13
9	6.99	7.25	8.35	6.81	6.65	7.57	6.99	6.80	6.58	6.75	6.46	6.73	6.22	6.01	5.98	6.36
10	7.17	9.62	6.45	7.38	7.33	7.57	7.55	7.06	6.75	7.46	7.05	7.46	7.34	6.71	6.51	6.34
11	9.16	0.00	6.81	8.66	8.45	8.32	8.64	8.84	7.59	8.19	7.87	7.69	7.72	7.71	7.53	6.65
12	8.11	0.00	9.56	8.14	9.87	9.72	9.15	9.09	7.94	8.24	8.95	8.23	8.27	8.85	8.56	8.61

S.P.

23762.67739 27258.85061 33201.1958 43156.59804 37802.29593 30007.84 33 37a12.77412 53405.994 45300.12854 4.621.35699
52434.42054 53892.93599 52814.32795 47217.58929 51463.73 4a 03757.04781 16176.58

1986 complete data was not available at this time.

Table 8a. Commercial catch rates (t/hr) for pollock in Divs. 4VWX and SA 5 (POK = pollock; MSP = main species).

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Canadian OTB-1,2 (TC5) CPUE (t/hr^{-1})																
June-August (Pok = MSP)	.74	.78	.81	1.07	.58	.61	.52	.69	.84	1.16	.97	.89	1.58	.87	1.28	.70

Table 8b. Catch rates for Canadian vessels (OTB-1, 2 (TC 4+)) from the International Observer Program with trips and sets directed for pollock.

4VW				4X+5			
Year	Month	Trip	Set	Year	Month	Trip	Set
1980	Feb	1.23	1.90	1980	Feb	2.48	1.33
	Mar	2.09	2.46		Mar	2.17	0.53
	Nov	0.59	0.71		Sep	1.00	3.50
	Dec	0.77	2.70		Nov	0.40	1.40
1981	Jan	0.30	0.43	1981	Jan	0.63	0.70
	Feb	1.70	1.89		Feb	1.16	1.30
	Mar	1.00	1.07		Mar	1.35	1.87
	May	0.025	1.00		Apr	0.71	0.48
	Jun	0.69	1.02		Sep	0.68	0.74
	Apr	0.38	0.93		Oct	0.74	1.83
	Sep	0.47	0.57		Nov	0.72	1.16
	Oct	0.65	0.87		Dec	2.78	4.37
	Nov	1.78	2.19				
	Dec	2.65	3.27				
1982	Jan	0.91	1.47	1982	Jan	1.22	2.34
	Mar	0.40	0.98		Apr	0.28	0.24
	Apr	1.01	0.90		May	1.20	1.20
	May	1.55	1.12		Jun	2.94	4.16
	Jun	0.25	0.54		Aug	1.30	2.77
	Aug	0.73	1.56		Oct	1.19	2.19
	Oct	0.75	1.18		Nov	0.79	1.90
	Nov	1.59	2.22		Dec	0.10	0.10
	Dec	1.76	2.02				
	Sep	-	0.38		Feb	-	0.71
					Sep	-	0.94
1983	Jan	1.64	1.64	1983	Jan	0.47	0.91
	Mar	1.72	2.03		Mar	1.84	1.92
	Apr	1.09	1.63		Jun	0.30	1.74
	May	1.47	3.10		Jul	0.35	1.75
	Jun	0.80	1.03		Sep	0.58	1.59
	Jul	0.44	0.32		Nov	0.68	2.61
	Sep	1.04	1.52				
	Nov	0.77	0.71		Aug	-	0.85
	Dec	0.92	1.75		Oct	-	0.10
	Aug	-	1.18				
	Oct	-	0.37				
1984	Jan	0.22	0.22	1984	Jan	0.56	3.63
	Feb	0.55	1.11		Feb	1.11	1.32
	Mar	1.60	2.11		Mar	0.79	1.14
	May	1.83	1.31		May	4.95	4.95
	Jun	1.24	1.77		Jul	2.00	2.00
	Jul	0.29	0.94		Sep	0.02	0.05
	Sep	1.39	0.35		Oct	1.25	1.25
	Oct	1.18	2.91		Nov	1.46	1.64
	Nov	1.08	2.30				
	Dec	2.20	2.49				

Table 8b. Continued.

4VW				4X+5			
Year	Month	Trip	Set	Year	Month	Trip	Set
1985	Jan	2.20	2.20	1985	Jan	0.71	0.94
	Mar	0.99	2.93		Feb	0.56	1.15
	May	0.51	1.09		Mar	1.16	2.19
	Jun	0.57	1.63		Apr	0.51	2.20
	Jul	1.89	2.32				
					Jul	-	0.75
	Feb	-	2.18				
	Apr	-	1.82				

Table 9a. Estimated total population numbers (x 10^{-3}) from the Canadian summer bottom trawl surveys, Strata 43 - 95. (No conversion factors were used.)

	A.T. CAMERON												LADY HAMMOND		ALFRED NEEDLER		
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1983	1984	1985
2	8879	3579	479	1929	203	37	161	1290	19	0	2826	774	1023	706	496	612	9691
3	2181	2666	939	1849	4677	89	989	3743	852	47	3350	871	11574	385	4231	373	29441
4	1330	822	6187	5731	1171	1541	2825	4873	3118	3285	9525	287	1130	1574	6518	1213	20829
5	972	199	1838	2007	1537	1386	4992	10081	4587	3794	16901	2720	472	761	690	3318	22454
6	951	92	570	276	832	1822	1202	7080	1691	2817	5865	1913	1435	119	297	428	18140
7	792	147	165	110	943	305	1983	1001	1543	1158	3540	1251	1265	488	408	384	2899
8	479	55	294	202	547	452	718	1775	482	755	1339	1084	634	1852	1273	994	594
9	184	36	254	252	418	142	202	598	213	56	514	347	508	603	531	1306	1313
10	159	110	129	18	260	18	220	313	9	185	304	338	301	202	234	610	1865
11	214	187	55	129	621	36	92	166	0	0	0	125	87	258	210	127	701
12	56	0	37	56	222	0	93	74	74	0	0	0	119	52	75	200	515

Table 9b. Percent of the estimated population numbers by age in the Canadian summer bottom trawl survey series (%).

	A.T. CAMERON												LADY HAMMOND		ALFRED NEEDLER		
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1983	1984	1985
2	55	45	4	15	2	1	1	4	0	0	6	8	6	10	3	6	9
3	13	34	9	15	41	2	7	12	7	0	8	9	62	5	28	4	27
4	8	10	57	46	10	26	21	16	25	27	22	3	6	22	43	13	19
5	6	3	17	16	13	24	37	33	36	31	38	28	3	11	5	35	21
6	6	1	5	2	7	31	9	23	13	23	13	20	8	2	2	4	17
7	5	2	2	1	8	5	15	3	12	10	8	13	7	7	3	4	3
8	3	1	3	2	5	8	5	6	4	6	3	11	3	26	9	10	1
9	1	0	2	2	4	2	1	2	2	0	1	4	3	9	4	14	1
10	1	1	1	0	2	0	2	1	0	2	1	3	2	3	2	6	2
11	1	2	1	1	5	1	1	1	0	0	0	1	0	4	1	1	1
12	0	0	0	0	2	0	1	0	1	0	0	0	1	1	0	2	0

Table 10. Stratified mean numbers-per-standard-tow for pollock in Canadian summer bottom trawl surveys (Strata 43-95).

	AGES																
Year	1	2	3	4	5	6	7	8	9	10	11	12	12+	UK	4+	5+	6+
(A)																	
A.T. CAMERON (summer)																	
1970	0.008	1.916	0.471	0.287	0.210	0.205	0.171	0.103	0.040	0.000	0.046	0.012	0.000	0.008	1.082	0.795	0.585
1971	0.000	0.775	0.578	0.177	0.043	0.020	0.034	0.012	0.008	0.024	0.000	0.000	0.000	0.000	0.318	0.141	0.098
1972	0.012	0.103	0.203	1.335	0.397	0.123	0.036	0.064	0.055	0.028	0.012	0.008	0.020	0.012	2.090	0.755	0.358
1973	0.000	0.428	0.399	1.237	0.433	0.060	0.024	0.044	0.055	0.004	0.028	0.012	0.000	0.000	1.897	0.660	0.227
1974	0.008	0.044	1.010	0.253	0.332	0.180	0.204	0.118	0.090	0.056	0.134	0.048	0.000	0.000	1.415	1.162	0.830
1975	0.000	0.008	0.019	0.351	0.299	0.393	0.066	0.098	0.031	0.004	0.008	0.000	0.000	0.000	1.250	0.899	0.600
1976	0.000	0.035	0.214	0.612	1.077	0.260	0.428	0.155	0.044	0.048	0.020	0.020	0.028	0.008	2.900	2.088	1.011
1977	0.000	0.278	0.836	1.056	2.176	1.528	0.216	0.383	0.129	0.068	0.036	0.016	0.000	0.004	5.612	4.556	2.380
1978	0.000	0.004	0.184	0.673	0.990	0.365	0.333	0.104	0.046	0.002	0.000	0.016	0.120	0.041	2.690	2.017	1.027
1979	0.000	0.000	0.118	0.709	0.819	0.608	0.250	0.163	0.012	0.040	0.000	0.000	0.000	0.046	2.647	1.938	1.119
1980	0.011	0.610	0.723	2.056	3.648	1.266	0.764	0.289	0.111	0.066	0.000	0.000	0.000	0.006	8.206	6.150	2.502
1981	0.007	0.167	0.188	0.062	0.587	0.413	0.270	0.234	0.075	0.073	0.027	0.000	0.001	0.043	1.785	1.723	1.136
LADY HAMMOND (summer)																	
1982	0.000	0.258	2.919	0.285	0.119	0.362	0.319	0.160	0.128	0.076	0.022	0.030	0.018	0.038	1.557	1.272	1.153
1983	0.138	0.178	0.097	0.397	0.192	0.030	0.123	0.467	0.152	0.051	0.065	0.013	0.021	0.190	1.701	1.304	1.112
ALFRED NEEDLER (summer)																	
1983	0.111	0.125	1.067	1.644	0.174	0.075	0.103	0.321	0.134	0.059	0.053	0.019	0.032	0.009	2.623	0.979	0.805
1984	0.057	0.402	0.235	0.765	2.109	0.276	0.239	0.591	0.794	0.370	0.076	0.119	0.098	0.223	5.660	4.895	2.786
1985	0.006	1.678	5.132	3.632	3.933	3.183	0.509	0.107	0.233	0.325	0.122	0.092	0.109	0.002	12.247	8.614	4.681
1986	0.054	0.651	0.723	0.974	1.003	1.470	1.176	0.089	0.013	0.121	0.152	0.043	0.051	0.007	5.099	4.125	3.122

(B)

Research vessel catch rates (nos. per standard tow) for pollock in NAFO Divisions 4VWX, 5A5, and 5A6.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A.T. Cameron (1970-81)* Lady Hammond (1982)* Alfred Needler (1983-86)*	3.48	1.67	2.40	2.72	2.48	1.27	2.95	6.72	2.88	2.77	9.55	2.15	4.73	3.93	6.35	19.06	6.53

* Number/Tow^{-1}

Table 11. Spring (1978-84), summer (1970-84), and fall (1978-83) research vessel survey. Catch rates for all years by strata.

Strata	Spring	Summer	Fall
40	1.1323	0	0.2334
41	0.4048	0.1907	0.1771
42	0.8499	0	1.3776
43	0	0.0169	0.2047
44	0.7586	0.0117	0.1313
45	0.5725	0	0.0886
46	1.8164	0.1703	0.3607
47	0	0.0599	0
48	0.1703	0	0.1188
49	1.0373	0.1977	0
50	1.0527	0.1440	0.0827
51	3.8492	0.8100	1.7479
52	2.2456	0.7712	0.8364
53	0.3106	0.0169	0.1188
54	0.6735	0.0273	0.2261
55	0.0326	0.0326	0.1703
56	0.0670	0.1313	0.1250
57	0.2483	0.0886	0.0827
58	0.1977	0.0220	0
59	0.1703	0.2261	1.7479
60	6.8155	5.2546	3.3190
61	9.6757	0.6503	1.2507
62	1.3040	0.9191	7.4248
63	0.2334	0.7586	1.5544
64	0.1907	0.2788	0.5513
65	1.3589	0.5513	2.0345
66	3.4354	0	0
70	4.6552	8.6157	1.0841
71	3.8492	0.9477	0.5408
72	5.6719	2.3577	1.7034
73	0.3270	0.0655	0.1065
74	0	0.0488	0.1126
75	1.7933	0.0655	0.3869
76	2.7544	3.8060	2.3864
77	5.9883	0.1703	0.2047
78	37.5918	0.4231	0
80	0.6853	0.4512	0.9191
81	8.1711	0.7337	0.8364
82	15.9446	1.5138	2.6899
83	2.5344	0.5202	0
84	3.3962	3.0609	1.6383
85	3.7631	7.4248	2.9556
90	0.1188	1.3589	0
91	0.2334	2.7220	3.2810
92	0.4900	1.9351	1.2160
93	0.1771	0.8634	0
94	0	0.2261	0
95	0	0.4608	0.0945

Table 12a. U.S.A. Research Survey catch rates at age (Nos. per standard tow).

	SPRING															SUMMER				AUTUMN											
Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1977	1978	1979	1980	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
0	0.01	0.01																		0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01			
1	0.52	0.15	1.20	0.01	0.01	0.01	0.08	0.14	0.00	0.10	0.15	0.01	0.13	0.57	0.15	0.05	0.00	0.05	10.67	0.13	0.11	0.38	0.03	0.00	0.22	0.03	0.06	0.03	0.01	0.13	0.07	0.07	0.49
2	0.05	0.13	1.49	2.80	0.10	0.33	0.11	0.38	0.22	0.05	0.15	0.72	1.63	0.06	0.15	0.23	0.57	0.00	0.11	0.08	0.38	0.27	0.71	0.08	0.06	0.03	0.17	0.19	0.02	0.01	3.59	0.44	0.03
3	0.17	0.13	0.90	0.51	0.53	0.20	0.14	0.23	0.42	0.07	0.09	0.13	0.84	0.02	0.09	0.09	0.17	0.38	0.06	0.01	0.16	0.20	0.12	0.28	0.03	0.15	0.24	0.04	0.26	0.01	0.98	0.40	0.05
4	0.20	0.09	0.20	0.15	0.14	0.34	0.15	0.06	0.65	0.08	0.28	0.12	0.55	0.02	0.10	0.26	0.09	0.26	0.29	0.09	0.02	0.08	0.17	0.20	0.11	0.55	0.29	0.04	0.33	0.05	0.14	0.29	0.04
5	0.05	0.07	0.05	0.14	0.08	0.08	0.24	0.16	0.63	0.15	0.25	0.18	0.11	0.01	0.14	0.29	0.08	0.36	0.25	0.08	0.06	0.07	0.11	0.11	0.07	1.63	0.42	0.09	0.19	0.11	0.20	0.01	0.07
6	0.07	0.08	0.05	0.04	0.16	0.09	0.13	0.32	0.15	0.14	0.20	0.26	0.33	0.00	0.07	0.32	0.08	0.55	0.30	0.08	0.09	0.08	0.11	0.08	0.04	0.50	0.38	0.09	0.13	0.06	0.13	0.05	0.01
7	0.09	0.04	0.07	0.03	0.07	0.10	0.15	0.13	0.11	0.08	0.23	0.08	0.11	0.05	0.04	0.15	0.05	0.36	0.22	0.04	0.04	0.07	0.09	0.09	0.09	0.31	0.22	0.15	0.08	0.07	0.04	0.04	0.06
8	0.12	0.09	0.12	0.10	0.03	0.08	0.17	0.11	0.08	0.16	0.08	0.07	0.14	0.04	0.04	0.23	0.09	0.49	0.03	0.02	0.08	0.05	0.07	0.01	0.01	0.14	0.11	0.08	0.09	0.13	0.00	0.02	0.08
9	0.08	0.06	0.04	0.04	0.00	0.05	0.11	0.02	0.07	0.08	0.04	0.05	0.05	0.01	0.05	0.07	0.03	0.06	0.02	0.01	0.03	0.04	0.00	0.02	0.01	0.05	0.09	0.06	0.05	0.08	0.00	0.02	0.03
10	0.04	0.07	0.07	0.09	0.01	0.06	0.03	0.02	0.05	0.03	0.02	0.09	0.01	0.02	0.03	0.08	0.01	0.21	0.07	0.02	0.01	0.03	0.12	0.00	0.01	0.01	0.02	0.04	0.04	0.06	0.01	0.00	0.02
11	0.04	0.07	0.04	0.02	0.10	0.02	0.04	0.01	0.04	0.03	0.00	0.06	0.02	0.02	0.04	0.07	0.05	0.00	0.05	0.01	0.01	0.03	0.02	0.02	0.01	0.01	0.00	0.03	0.01	0.04	0.00	0.02	0.02
12+	0.23	0.20	0.17	0.09	0.16	0.29	0.24	0.04	0.07	0.08	0.05	0.20	0.07	0.10	0.07	0.23	0.08	0.23	0.13	0.07	0.09	0.10	0.10	0.02	0.03	0.29	0.14	0.12	0.06	0.07	0.08	0.04	0.06
Totals																																	
1+	1.66	1.18	4.40	4.02	1.39	1.65	1.59	1.62	2.49	1.05	1.54	1.97	3.99	0.92	1.00	2.07	1.30	2.95	2.20	0.64	1.08	1.40	1.65	0.91	0.69	3.70	2.14	0.96	1.27	0.82	5.24	1.40	0.98
2+	1.14	1.03	3.20	4.01	1.38	1.64	1.51	1.48	2.49	0.95	1.39	1.96	3.86	0.35	0.85	2.02	1.30	2.90	1.53	0.51	0.97	1.02	1.62	0.91	0.47	3.67	2.08	0.93	1.26	0.69	5.17	1.33	0.49
3+	1.09	0.90	1.71	1.21	1.28	1.31	1.40	1.10	2.27	0.90	1.24	1.24	2.23	0.29	0.70	1.79	0.73	2.90	1.42	0.43	0.59	0.75	0.91	0.83	0.41	3.64	1.91	0.74	1.24	0.68	1.58	0.89	0.46
4+	0.92	0.77	0.81	0.70	0.75	1.11	1.26	0.87	1.85	0.83	1.15	1.11	1.39	0.27	0.61	1.70	0.56	2.52	1.36	0.42	0.43	0.55	0.79	0.55	0.38	3.49	1.67	0.70	0.98	0.67	0.60	0.49	0.41
5+	0.72	0.68	0.61	0.55	0.61	0.77	1.11	0.81	1.20	0.75	0.87	0.99	0.84	0.25	0.51	1.44	0.47	2.26	1.07	0.33	0.41	0.47	0.62	0.35	0.27	2.94	1.38	0.66	0.65	0.62	0.46	0.20	0.37

Table 12b. Stratified mean catch-per-tow in weight (kg) and numbers for Scotian Shelf, Gulf of Maine, and Georges Bank pollock in NEFC[1] offshore spring[2], summer[3], and autumn[4][1] bottom trawl surveys, 1963-1983.

Year	SPRING[4]		SUMMER		AUTUMN	
	Weight	Numbers	Weight	Numbers	Weight	Numbers
1963	-	-	10.28	2.31	5.79	1.46
1964	-	-	5.27	2.06	4.40	1.64
1965	-	-	2.56	1.72	2.74	0.83
1966	-	-	-	-	2.35	0.97
1967	-	-	-	-	1.80	0.52
1968	4.47	1.09	-	-	3.17	0.69
1969	2.66	1.12	1.75	0.70	6.58	1.31
1970	4.91	1.67	-	-	2.59	0.64
1971	4.39	1.18	-	-	3.96	1.09
1972	5.67	4.43	-	-	4.37	1.41
1973	4.82	4.00	-	-	4.71	1.64
1974	4.10	1.39	-	-	3.17	0.90
1975	5.90	1.67	-	-	2.04	0.70
1976	6.84	1.59	-	-	16.66	3.69
1977	3.44	1.63	9.98	2.07	8.78	2.14
1978	6.56	2.48	4.05	1.29	5.83	0.98
1979	4.75	1.06	17.57	2.96	5.81	1.28
1980	4.40	1.52	9.83	12.21	4.63	0.83
1981	6.30	2.00	-	-	7.75	5.24
1982	6.62	3.98	-	-	3.14	1.40
1983	1.83	0.92	-	-	3.03	0.98
1984*	2.87	1.00	-	-	0.99	0.41

[1] NEFC = Northeastern Fisheries Centre

[2] Strata 13-40.

[3] Strata 21-28 and 37-40.

[4] The "36 Yankee" trawl was used from 1968-1972, and the "41 Yankee" trawl was used from 1973-1983. No gear conversion factors are available to adjust for differences in fishing power.

* Provisional

Table 12c. Stratified mean catch-per-tow in numbers and weight (kg) for pollock in the Massachusetts inshore spring surveys[1] and NEFC inshore summer surveys[2], 1977-1983.

Year	Stratified Mean Catch-Per-Tow in Numbers AGE 0	1	2	3	Total	Stratified Mean Catch-Per-Tow in Weight (kg)
NEFC (Summer)						
1977	0.00	1.11	0.82	0.00	1.93	0.61
1978	0.00	0.00	0.00	0.00	0.00	0.00
1979	1.17	0.35	0.00	0.00	1.52	0.18
1980	0.17	0.33	0.00	0.00	0.50	0.06
Massachusetts (Spring)						
1978	2.07	0.01	0.13	0.06	2.27	0.11
1979	4.34	0.04	0.01	0.06	4.45	0.07
1980	0.30	8.37	0.20	0.02	8.89	0.72
1981	1.52	1.42	1.40	0.00	4.34	0.54
1982	1.79	0.00	0.06	0.00	1.85	0.03
1983	0.03	6.45	0.27	0.04	6.79	0.68
1984	0.04	0.00	0.02	0.00	0.06	0.01

[1] Regions 1-5 (STRATA 11-21 and 25-36).

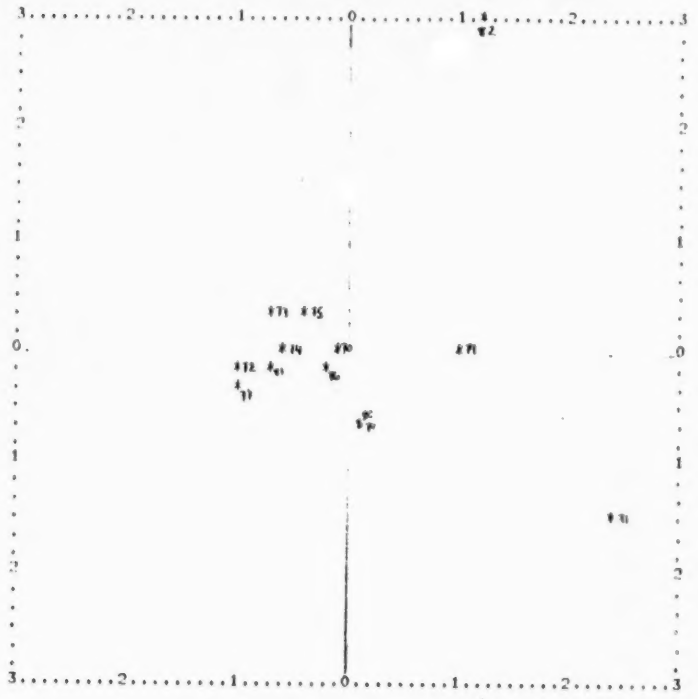
[2] Inshore STRATA 52, 55, 56, 58-61, 63-66, 72, 74, and 75.

Table 13a. Data for a principal component analysis of stock status.

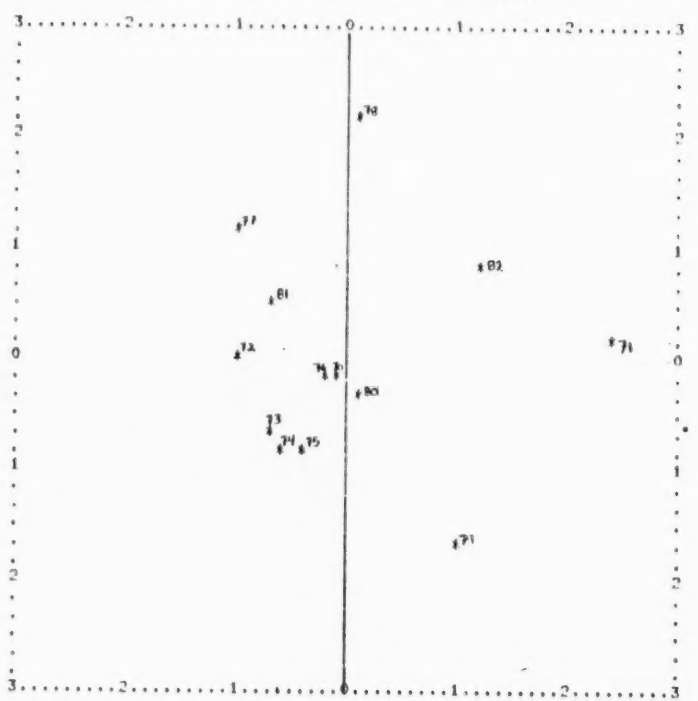
Year	Can. R.V. Survey Age 1	Can. R.V. Survey Age 2	Can. R.V. Survey Age 3	US. R.V. Survey Age 0	US. R.V. Survey Age 1	US. R.V. Survey Age 2	Comm. Wt. at Age 1	Comm. Wt. at Age 2	Comm. Wt. at Age 3	Comm. Wt. at Age 4	Propn. Mature Age 3	Propn. Mature Age 4	Propn. Mature Age 5	Total Catch (#s) Age 2	Total Catch (#s) Age 3	Total Catch (#s) Age 4
1970	0.00	0.103	0.399	0.01	0.15	1.49	0.0	1.06	1.28	1.95	0.59	0.53	0.96	799	2626	3482
1971	0.012	0.428	1.01	0.01	1.2	2.8	0.0	0.52	1.39	1.98	0.08	0.74	1.00	1434	7341	5354
1972	0.000	0.044	0.019	0.0	0.01	0.1	0.0	0.83	1.28	1.91	0.50	1.0	0.91	257	1450	3079
1973	0.008	0.008	0.214	0.0	0.01	0.33	0.0	0.86	1.23	1.59	0.84	0.62	0.98	258	2188	3874
1974	0.000	0.035	0.836	0.0	0.01	0.11	0.0	0.61	1.14	1.8	0.22	0.93	0.9	247	1782	3646
1975	0.000	0.278	0.184	0.0	0.09	0.38	0.0	0.83	1.23	1.64	0.81	0.51	1.0	57	1540	7455
1976	0.000	0.004	0.118	0.0	0.14	0.22	0.0	0.84	1.19	1.95	0.07	1.0	1.0	115	4092	3750
1977	0.000	0.000	0.723	0.0	0.0	0.05	0.0	0.73	1.40	2.49	0.64	1.0	1.0	300	692	1305
1978	0.000	0.610	0.188	0.0	0.1	0.15	0.19	0.85	1.47	2.55	0.56	1.0	1.0	1108	2754	2246
1979	0.011	0.167	2.919	0.0	0.15	0.72	0.0	0.62	1.11	1.66	0.34	0.67	1.0	697	5042	11271
1980	0.007	0.258	1.067	0.0	0.01	1.63	0.0	0.59	1.15	2.15	0.44	1.0	0.98	261	2684	5218
1981	0.000	0.125	0.235	0.0	0.13	0.06	0.0	0.78	1.47	1.92	0.47	0.81	-	82	1203	2903
1982	0.111	0.402	5.132	0.0	0.57	0.15	0.63	1.02	1.05	1.60	0.37	-	-	64	2335	806
1983	0.057	1.678		0.0	0.15	-	0.0	0.73	0.86	-	-	-	-	224	98	-
1984	0.006	-	-	0.0	-	-	0.0	-	-	-	-	-	-	0	-	-
1985	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FACTOR SCORES

X-AXIS IS FACTOR 1; Y-AXIS IS FACTOR 2



X-AXIS IS FACTOR 1; Y-AXIS IS FACTOR 3



SORTED FACTOR LOADINGS (PATTERN)

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
US1R	4	.885	.000	.000	.000	.261
TOTCA3	15	.853	-.369	.000	.000	.000
US2R	5	.694	-.481	.000	.000	.000
CRV2	2	.633	.000	.503	.000	-.325
TOTCA2	14	.610	-.558	.271	.000	.000
CRV1	1	.472	.837	.000	.000	.000
WT1	6	.367	.807	.424	.000	.000
CRV3	3	.567	.700	.000	.000	.000
WT2	7	-.261	.632	.287	.429	.000
TOTCA4	16	.300	-.280	-.742	.000	-.260
WT4	9	.000	-.523	.734	.000	.000
WT3	8	.000	-.568	.634	.380	.000
MAT4	11	-.282	-.316	.420	-.758	.000
MAT3	10	-.534	.000	.000	.574	-.476
MAT6	13	.000	.000	.000	.554	.722
MAT5	12	.410	.000	.274	.330	-.448
-	VP	4.194	3.774	2.458	1.904	1.306

Regression

PC1 scores vs Env. Ind.
r = 0.75
sl = 0.9
int = 0

PC2 scores vs Env. Ind.
r = 0.68
sl = 0.8
int = 1.4

Table 13b. Results of stock status matrix.

Table 14a. 4VW + 5 pollock PR for population.

Age	1.	2.	3.
1			
2	.051	.024	.026
3	.304	.249	.270
4	.619	.556	.602
5	.838	.761	.824
6	.976	.900	.974
7	1.015	.951	1.029
8	.995	.927	1.003
9	.918	.842	.911
10	1.087	1.000	1.082
11	.984	.923	.999

1. Calculated as average PR, 1979-84 when PR=F ÷ age 7• at mean F for the year. Age 6• could be set to 1.00.

2. Calculated using software developed by Marine Fish Division based on a multiplicative analysis of the model.

$$F_{it} = F_t S_i$$

where: F_{it} = F at age i and year t
F_t = fully recruited F in year t
S_i = partial recruitment at age i

3. Is the PR pattern in 2. standardized to the 6• average. Age 6• or 7• could be set to 1.000.

Table 14b. Average population Partial Recruitment patterns for 1970-1985.

Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	0.004	0.132	0.071	0.090	0.032	0.016	0.014	0.002	0.006	0.134	0.133	0.016	0.011	0.009	0.010	0.051
3	0.041	0.402	0.162	0.431	0.632	0.160	0.200	0.108	0.060	0.639	0.322	0.320	0.127	0.163	0.270	0.304
4	0.228	1.095	0.476	1.557	0.869	0.486	0.564	0.439	0.238	0.865	0.704	0.664	0.332	0.463	0.697	0.619
5	0.289	1.881	0.913	2.053	0.983	0.753	0.936	0.630	0.534	0.933	1.027	0.904	0.660	0.479	1.024	0.838
6	0.380	2.593	1.172	0.935	1.188	0.967	0.874	0.841	0.669	1.134	1.147	0.979	1.140	0.664	0.782	1.000
7	0.613	1.367	1.224	0.957	0.872	1.218	1.266	1.045	0.939	0.982	1.156	1.119	1.001	0.974	0.835	1.000
8	1.357	0.854	0.275	0.716	1.239	0.643	0.741	1.178	1.037	0.968	0.778	0.971	1.055	0.900	1.256	1.000
9	0.812	0.025	0.957	1.367	1.060	0.587	0.184	0.795	1.451	1.174	0.739	0.602	1.032	1.090	0.815	1.000
10	4.507	0.092	3.111	0.821	0.935	1.238	0.466	0.429	1.024	1.071	1.129	0.754	0.829	1.431	1.192	1.000
11	0.455	1.359	0.861	1.188	1.280	0.655	0.792	0.863	0.729	1.071	1.051	0.870	0.816	0.932	1.006	1.000

Table 15a. Calibration results using OTB-1,2 TC 5 June-August catch rates vs fishable biomass with average PR for 1974-85, excluding 1982.

	Terminal F				
	.45	.50	.55	.60	.65
r	.84	.89	.92	.91	.88
intercept	45242	47610	49535	51129	52468
slope	792	727	674	630	593
student T	3.13	4.53	5.84	6.18	5.66
SSQ last 5 residuals	6.34	5.73	5.13	5.20	5.73

Table 15b. OTB Partial Recruitment pattern 1971-1985.

Age	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	0.017	0.071	0.010	0.032	0.023	0.017	0.003	0.004	0.026	0.028	0.001	0.013	0.012	0.000	0.002
3	0.107	0.161	0.201	0.561	0.243	0.271	0.205	0.087	0.238	0.178	0.228	0.195	0.367	0.176	0.099
4	0.487	0.368	0.766	0.819	0.682	0.720	0.755	0.549	0.680	0.481	0.409	0.320	1.633	0.482	0.850
5	0.897	0.835	1.096	0.950	0.837	1.042	0.932	1.054	0.907	0.979	0.582	0.457	0.645	1.036	0.668
6	1.254	1.171	0.494	1.158	1.107	0.874	0.905	0.820	1.217	1.024	1.080	0.951	0.660	0.272	1.127
7	0.627	1.217	0.512	0.828	1.173	0.933	1.395	1.010	0.843	1.034	1.207	1.142	1.692	0.189	1.219
8	0.417	0.272	0.357	1.182	0.651	0.757	1.151	0.904	0.555	0.637	1.012	1.080	3.071	0.589	0.705
9	0.020	0.377	0.281	1.007	0.720	0.136	0.656	0.896	0.406	0.538	0.659	0.982	3.447	0.474	0.780
10	0.051	0.480	0.455	0.726	1.588	0.369	0.237	0.240	0.569	0.605	0.719	1.079	3.665	0.558	1.022
11	0.000	0.862	0.647	0.842	0.906	0.947	1.121	0.284	0.480	0.389	0.187	0.675	1.492	0.390	1.116

Table 16.

COHORT WITH FT = .55 20/ 9/86

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
2	29434	41441	26699	52465	25866	36128	46626	57011	32468	8606	25339	92635	43877	13188	20447
3	11761	24013	32616	21136	41657	20945	29346	37950	46625	26473	6775	19743	75818	35687	14817
4	7678	7281	17431	24737	14729	27463	15836	22047	29458	36780	17775	4920	13673	57016	29739
5	5111	5140	5474	11397	11883	8072	17849	10179	14546	20820	23367	11305	2847	9164	38481
6	3178	3232	2397	2910	4619	6745	5102	9366	6115	8534	12766	13054	5780	1984	5815
7	2384	1850	1218	1128	1729	2516	3510	2671	5235	3313	5029	6929	6406	2376	900
8	1234	1128	1006	559	665	1050	1122	1667	1407	2491	2034	2578	3160	2385	1159
9	612	300	715	243	358	356	624	588	786	887	1480	1246	1320	1298	1454
10	225	245	244	373	371	204	217	472	370	256	352	720	745	577	827
11	353	3	195	46	230	220	90	146	313	161	153	189	508	370	221
2+1	61992	86635	87995	115476	102308	104900	120113	142680	137303	107286	95471	153641	153529	127176	108711
3+1	32558	45194	61296	63011	76441	78772	73487	85667	104835	77380	70132	61006	197652	110988	88265
4+1	20797	21181	28680	41875	34784	47827	44141	47719	58210	72902	63357	41263	34440	75301	73448
5+1	13102	11900	11248	17138	19854	20364	28305	25672	29751	36122	45381	36343	20767	13284	46633
6+1	7991	6759	5775	5738	7973	11291	10664	15493	14206	15302	22014	25018	17920	9122	10175

	1985
2	8891
3	16682
4	11042
5	17212
6	20918
7	3627
8	551
9	613
10	836
11	339
2+1	80772
3+1	71881
4+1	55198
5+1	44156
6+1	26944

MIDYEAR BIOMASS F=.55 20/ 9/86

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
2	13172	27021	25238	24470	19296	27782	25547	42832	24782	5585	17012	51935	23216	12855
3	16656	34745	53003	22771	47373	23367	31500	38161	51211	28047	8116	24229	72807	35635
4	15006	15347	35940	33706	22917	43754	24487	28756	44701	48492	28081	7419	28746	78438
5	13818	11353	17541	18879	27625	21078	36491	20710	30183	39127	42487	24297	7508	22549
6	9575	8254	8904	8791	14130	19398	14255	25492	18032	23405	33688	32644	15892	4775
7	7703	6908	5033	4257	6884	8790	11372	9351	16818	12196	15566	21032	17849	8246
8	3763	5655	5587	2818	3018	5363	4862	6565	5513	10771	9050	11196	11282	10730
9	2818	1966	4390	3590	1820	2129	3805	3429	3062	3459	7580	6557	5992	5710
10	376	2197	765	2183	2120	1054	1354	2732	1696	1494	2029	5174	3731	2497
11	2423	0	996	298	1438	1425	601	959	1746	1031	910	1069	2854	2052
2+1	85311	115356	157378	123163	146621	154559	154274	178787	197743	177307	173518	186843	191478	181278
3+1	72139	88335	132140	98693	127325	126777	128726	136154	172961	171722	154507	135008	168263	168723
4+1	55483	51590	79157	75922	79953	103210	97226	97993	121751	143675	146391	110788	95656	133088
5+1	40477	36243	43216	42016	57036	59256	72740	69237	77049	97183	118310	101367	66710	54650
6+1	26658	24890	25675	22137	29411	38158	36249	48528	46866	52056	68823	77072	59401	34302

	1984	1985
2	18740	5801
3	18850	14692
4	46623	16428
5	73543	34679
6	16275	47536
7	3656	9530
8	4925	1937
9	6872	2742
10	3050	3994
11	1283	1586
2+1	194033	138770
3+1	175293	133162
4+1	156248	118477
5+1	109625	102055
6+1	36082	67376

F MATRIX F=.55 20/ 9/84

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	0.004	0.039	0.034	0.031	0.011	0.008	0.006	0.001	0.004	0.039	0.050	0.008	0.007	0.005	0.003	0.028
3	0.037	0.120	0.076	0.148	0.217	0.080	0.086	0.053	0.037	0.187	0.120	0.167	0.077	0.087	0.074	0.167
4	0.204	0.328	0.228	0.533	0.298	0.243	0.242	0.216	0.147	0.254	0.262	0.347	0.209	0.247	0.242	0.340
5	0.258	0.563	0.432	0.703	0.337	0.376	0.401	0.310	0.330	0.274	0.382	0.473	0.399	0.255	0.356	0.461
6	0.340	0.776	0.554	0.320	0.407	0.483	0.375	0.413	0.413	0.332	0.427	0.512	0.689	0.353	0.272	0.550
7	0.548	0.409	0.578	0.328	0.299	0.608	0.543	0.513	0.579	0.288	0.430	0.585	0.605	0.518	0.291	0.353
8	1.213	0.256	0.130	0.245	0.425	0.321	0.318	0.579	0.640	0.284	0.279	0.508	0.637	0.479	0.437	0.550
9	0.728	0.007	0.452	0.468	0.364	0.293	0.079	0.391	0.878	0.344	0.225	0.314	0.624	0.580	0.283	0.550
10	4.030	0.027	1.471	0.281	0.321	0.618	0.200	0.211	0.632	0.314	0.420	0.394	0.501	0.781	0.415	0.550
11	0.407	0.407	0.407	0.407	0.439	0.327	0.340	0.424	0.450	0.314	0.391	0.455	0.493	0.496	0.350	0.550

FSUM F=.55 20/ 9/84

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
2	3.723	4.192	3.603	3.330	2.944	3.645	3.674	3.103	3.120	2.089	1.494	1.238	0.786	0.439	0.171	0.028
3	2.477	3.719	4.152	3.569	3.300	2.933	3.637	3.668	3.102	3.116	2.060	1.444	1.230	0.770	0.434	0.167
4	2.990	2.440	3.599	4.076	3.422	3.083	2.854	3.551	3.615	3.065	2.927	1.740	1.477	1.153	0.705	0.340
5	3.180	2.787	2.112	3.374	3.542	3.124	2.840	2.612	3.335	3.468	2.811	2.667	1.593	1.077	0.906	0.461
6	1.995	2.922	2.224	1.680	2.671	3.205	2.748	2.439	2.302	3.005	3.194	2.429	2.194	1.124	0.822	0.550
7	1.976	1.655	2.145	1.670	1.360	2.263	2.723	2.373	2.025	1.887	2.673	2.787	1.917	1.505	0.841	0.550
8	3.099	1.428	1.246	1.567	1.342	1.061	1.655	2.180	1.860	1.446	1.601	2.243	2.182	1.312	0.787	0.550
9	1.161	1.385	1.173	1.116	1.322	0.917	0.740	1.337	1.601	1.219	1.162	1.312	1.735	1.545	0.833	0.550
10	4.437	0.434	1.878	0.720	0.648	0.938	0.624	0.661	0.946	0.705	0.875	0.887	0.997	1.111	0.965	0.550
11	0.407	0.407	0.407	0.407	0.439	0.327	0.340	0.424	0.450	0.314	0.391	0.455	0.493	0.496	0.350	0.550

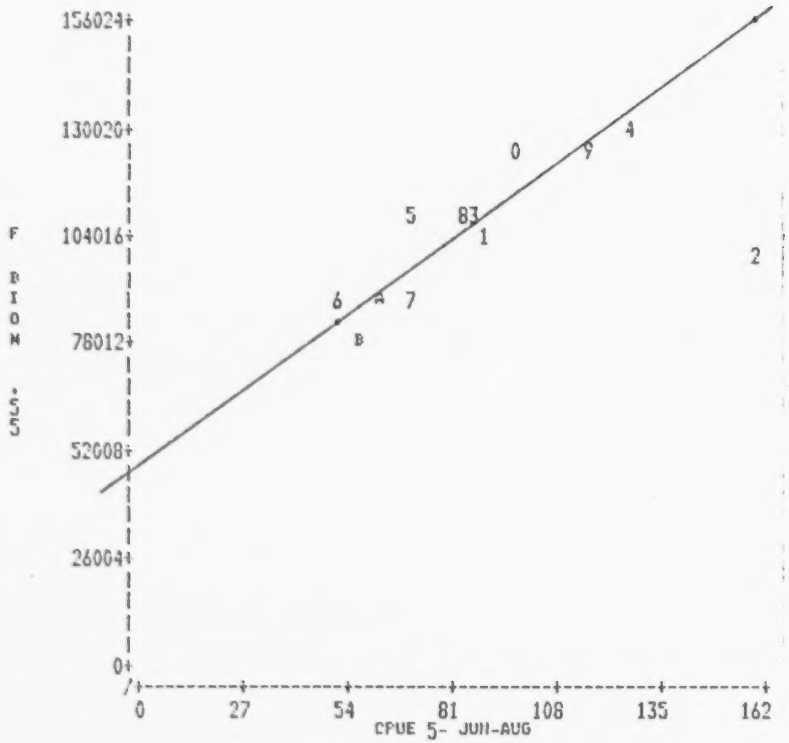
Table 16. (Continued)

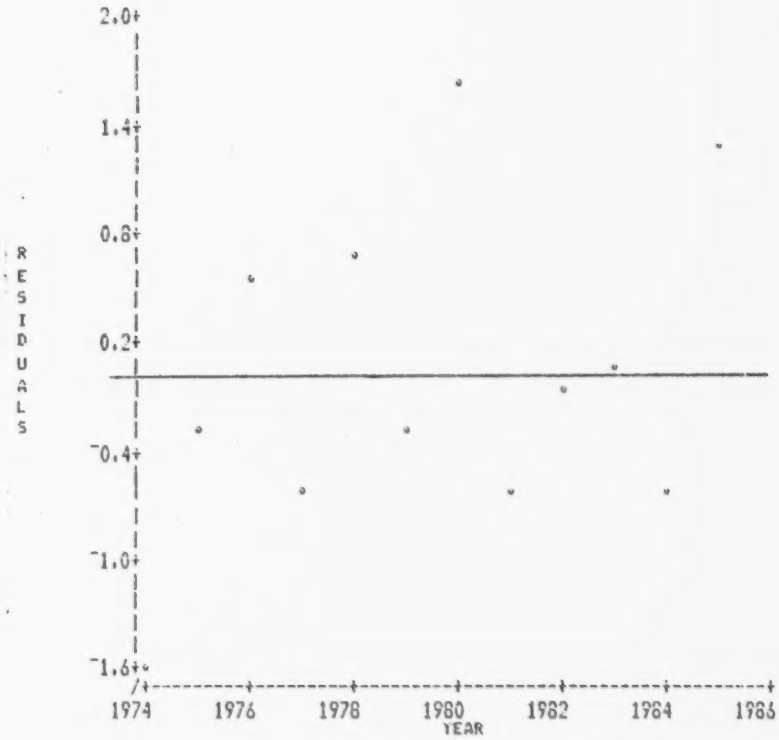
RESULTS OF REGRESSION

Y= 49535.46086+ 673.9730078 X

R2= 0.8381365188 R= 0.9154979622

STUDENT T FOR INTERCEPT= 5.838159067





S	YEAR	RESIDUALS	IND	DEP
B	1974	-1.566	58	76851
A	1975	-0.299	61	88399
6	1976	0.544	52	88673
7	1977	-0.689	69	90862
8	1978	0.666	84	111153
9	1979	-0.337	116	125185
0	1980	1.584	97	128819
1	1981	-0.661	89	104553
2	1982	1.000	156	96363
3	1983	0.090	87	106849
4	1984	-0.654	128	130884
5	1985	1.322	70	106651

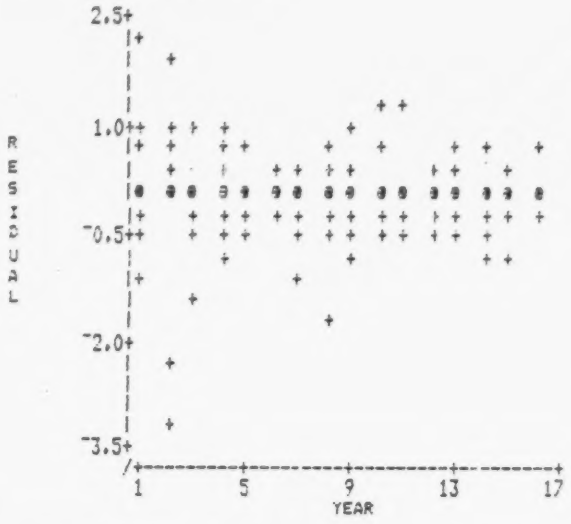
SSQ LAST 5 RES STAND 5.130005294

Table 16. (Continued)

RESIDUALS (OBS - PRED) AROUND LN F MATRIX 20/ 9/86

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-1.205	1.754	0.977	0.905	0.019	-0.243	-0.242	-1.049	-0.917	1.312	1.433	-0.371	-0.588	-0.745	-0.846	0.605
2	-1.113	0.647	-0.423	0.254	0.767	-0.165	0.204	-0.279	-0.912	0.652	0.095	0.396	-0.303	-0.129	0.208	0.162
3	-0.391	0.663	-0.330	0.551	0.100	-0.038	0.252	0.132	-0.525	-0.031	-0.109	0.139	-0.394	-0.072	0.168	-0.115
4	-0.534	0.821	-0.060	0.446	-0.159	0.017	0.376	0.110	-0.100	-0.337	-0.114	0.065	-0.087	-0.421	0.171	-0.193
5	-0.391	1.010	0.057	-0.472	-0.102	0.136	0.176	0.268	-0.007	-0.274	-0.136	0.013	0.327	-0.226	-0.231	-0.148
6	0.019	0.304	0.034	-0.516	-0.477	0.300	0.480	0.417	0.265	-0.485	-0.195	0.080	0.130	0.090	-0.232	-0.215
7	0.953	-0.028	-1.319	-0.666	0.013	-0.200	0.084	0.677	0.505	-0.360	-0.451	0.078	0.322	0.151	0.315	-0.076
8	0.718	-3.280	0.205	0.258	0.135	-0.012	-1.030	0.562	1.118	0.111	-0.224	-0.123	0.578	0.621	0.161	0.202
9	2.103	-2.307	1.055	-0.581	-0.320	0.405	-0.431	-0.383	0.441	-0.309	-0.129	-0.226	0.031	0.564	0.213	-0.126
10	-0.159	0.417	-0.199	-0.180	0.025	-0.201	0.131	0.345	0.132	-0.279	-0.170	-0.052	0.045	0.166	0.074	-0.096

RESIDUALS IN YEAR EFFECTS



CODED TABLE

```
============
   PPPPPPPPPP
** OUT **  : 1.756973125
   **********
HIGH FENCE: 1.009222133
   ++++++++++
HIGH HINGE: 0.2614711405
   ..........
   (MEDIAN: 0.01517979076)
   ..........
LOW HINGE : -0.2370295211
   ----------
LOW FENCE : -0.9847905136
   ==========
** OUT **  : -1.732531506
   MMMMMMMMMM
```

RESIDUALS IN AGE EFFECTS

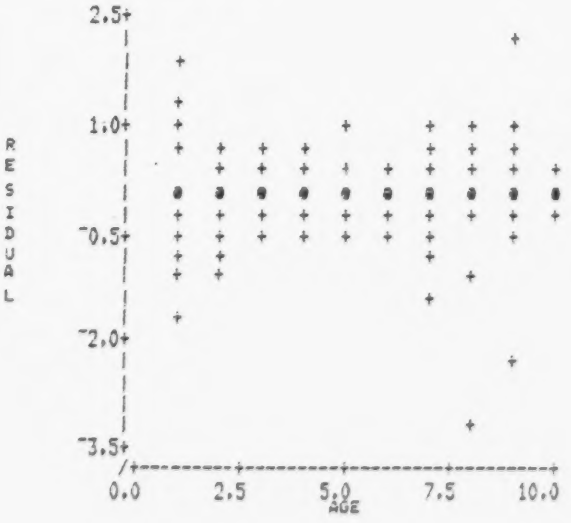
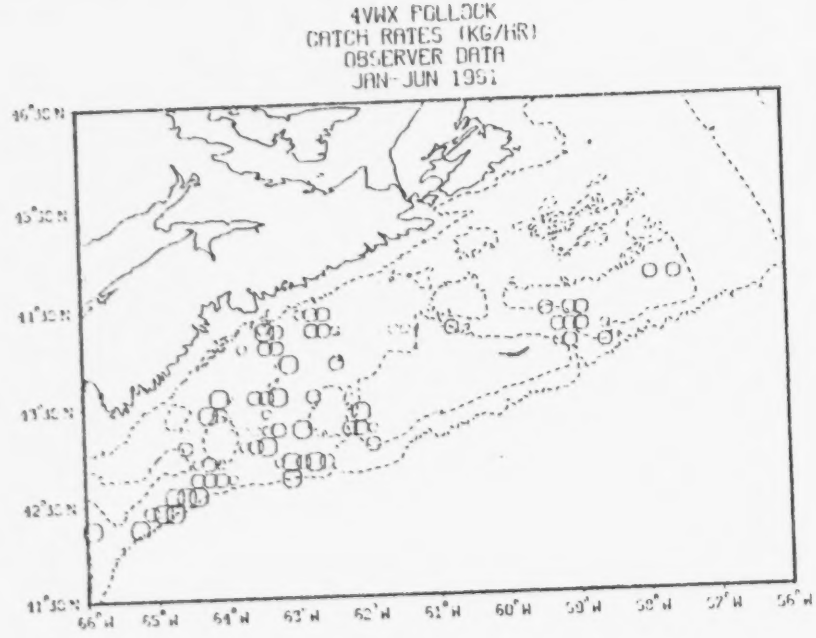
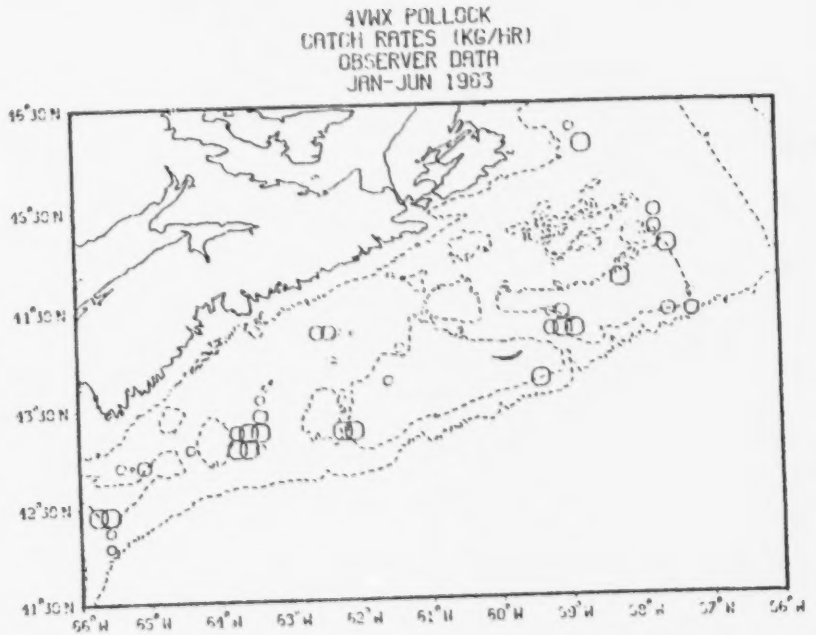
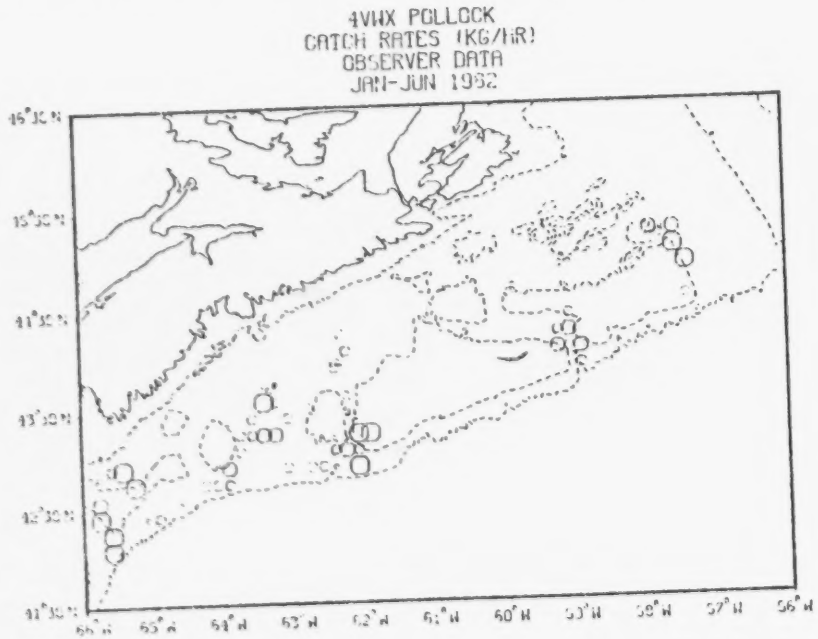


Table 16. (Continued)







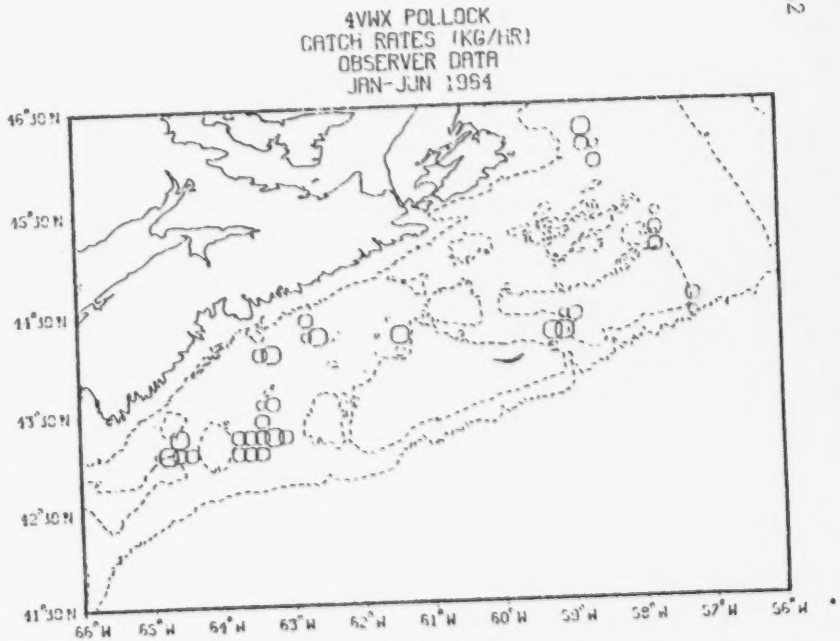


Figure 1a. Distribution maps of pollock trips (1981-1984) from the International Observer Prog[illegible]

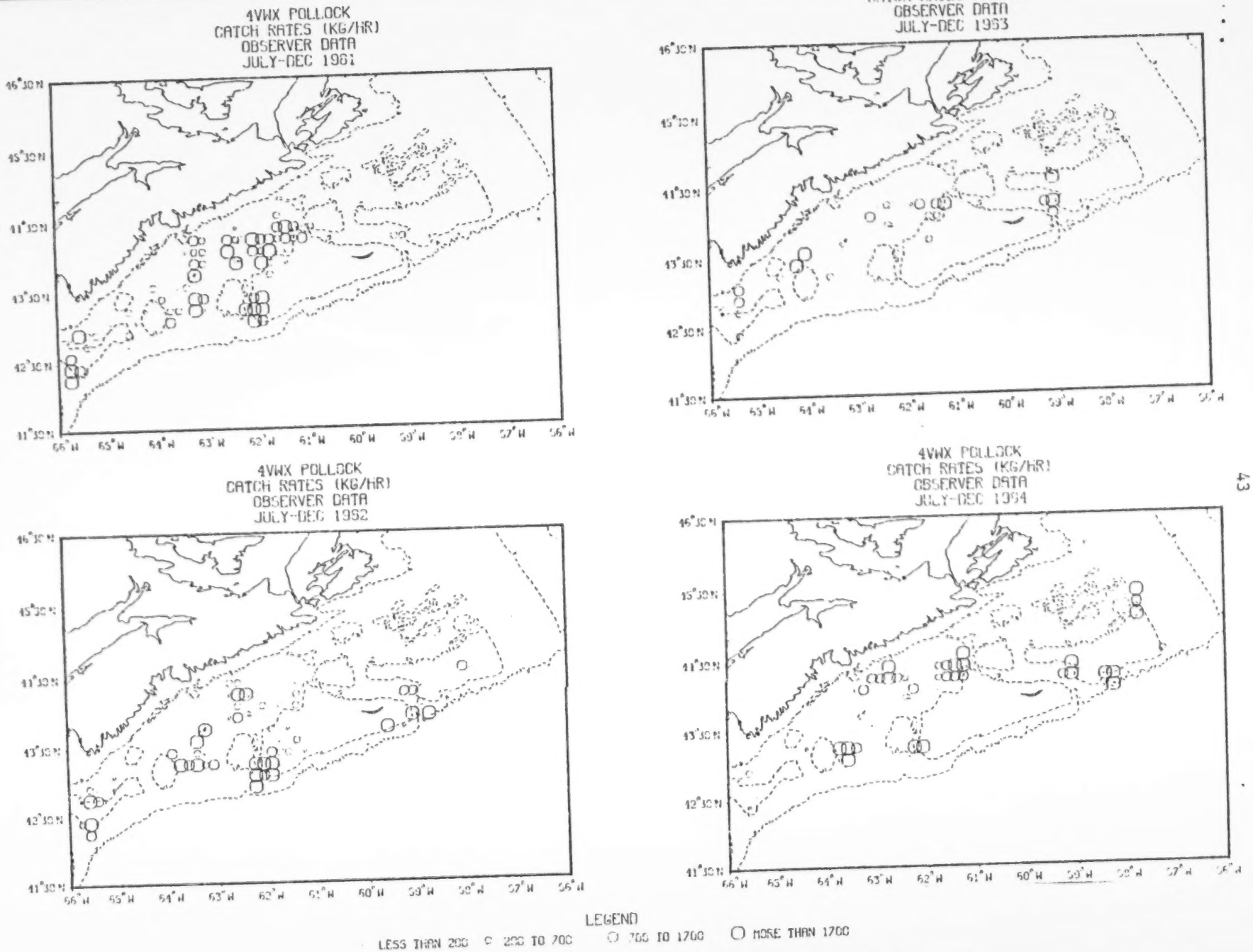


Figure 1b. Distribution maps of pollock trips (1981-1984) from the International Observer Program

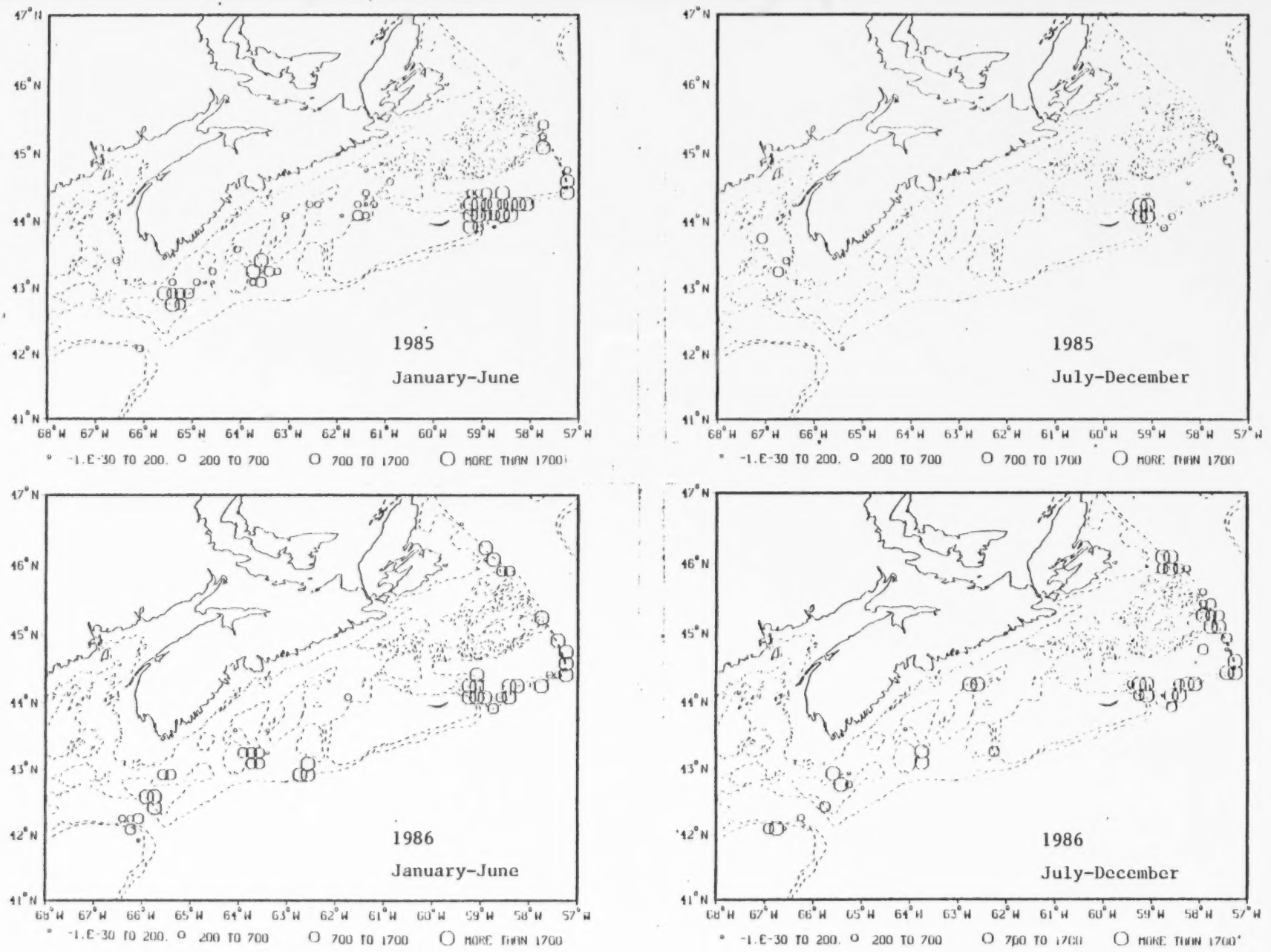


Figure 1c. 4VW+5 pollock catch rates (kg/hr) from Observer data.

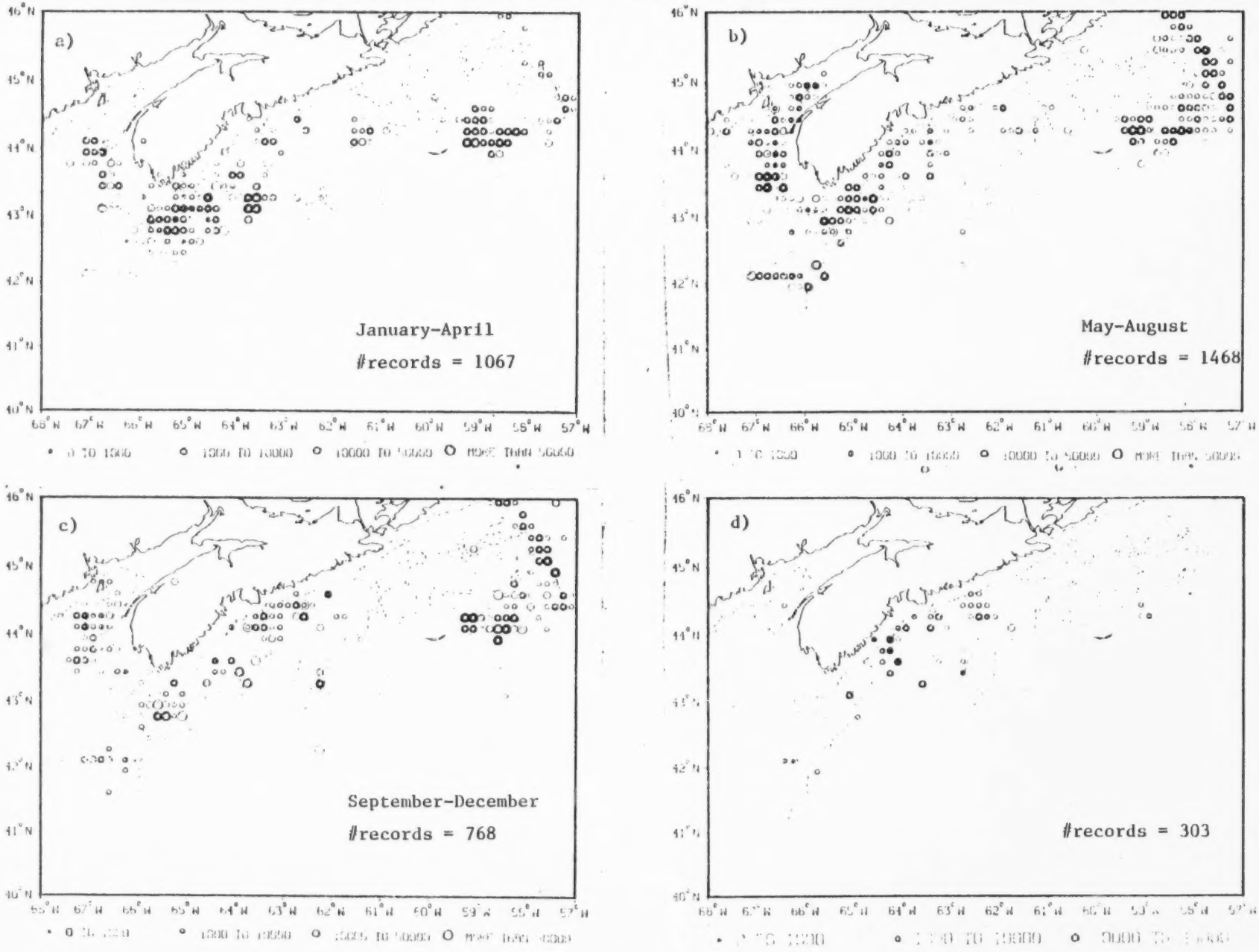


Figure 1d. a,b,c -- 1985 catches for OTB tonnage class combined
d -- 1985 catches for gilinets and longliners total for the year.